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Science and Invention

IN PICTURES

40 NON-TECHNICAL RADIO ARTICLES

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DIO NEWS SCIENCE & INVENTION THE EXPERIMENTER MOTOR

Vol. XII.
Whole No. 142

Science and Invention

FORMERLY
ELECTRICAL EXPERIMENTER

February, 1925
No. 10

IN OUR NEXT ISSUE

Can a Perpetual Motion Machine Be Patented?

The laws of the Patent Office of the United States state that a perpetual motion machine when so called, cannot be patented unless accompanied by a working model. We will show how several inventors have gotten around this law by means of adroit descriptions of their machines. However, even with these patents in existence, our $1000.00 prize offer still remains unclaimed to date.

* * *

What Do You Know About Sun Dials?

The past and present types of sun dials will be described by a well-known authority on "Time" who for several months past has contributed many interesting articles on that subject to this magazine. He will show how sun dials have been passed down through the centuries, changing very little in form and always remaining one of the simplest and most stable of time pieces.

* * *

Did You Ever See An Actor "Make Up"?

Simple as the art of "making up" may seem, still it is rather complicated in order to produce a satisfactory effect that is not too glaringly artificial. An authoritative article will deal with the various steps in the art of "making up," each step being fully illustrated and described.

* * *

Were You Ever Up In a Dirigible?

The fascinating subject of how dirigibles are steered and navigated will be dealt with by an expert on aeronautics. The illustrations will be complete and explicit and will show each and every little detail, all of which are so necessary in the safe navigation of a leviathan of the air such as the Shenandoah or the Los Angeles.

* * *

The above are just a few of the treats in store for our readers in the next issue. Hundreds of photographs and illustrations will also be published, accompanied by short, to the point descriptions.

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Publishers of SCIENCE & INVENTION, RADIO NEWS, THE EXPERIMENTER and MOTOR CAMPER & TOURIST.

Contents for February

POPULAR ARTICLES

Editorial 973
By H. Gernsback.
"Shipwrecked" On Stage..... 974
By A. P. Peck.
Movie Film Duplicates Figures.... 975
By H. Winfield Secor.
Viewing Mars From Mountain Top 976
Shooting the Air to Test Wind... 976
By Ernest Brennecke.
Automatic Railroad Crossing Gate. 977
By J. W. Von Stein.
If New York City's Water Supply Should Fall as Rain..... 977
By C. N. Holmes.
The Radio Teledactyl 978
By H. Gernsback.
Portable Electrocardiograph 979
Trick Sub-Sea Photography..... 980
By Edwin Shallert.
Social Life of the Ant..... 982
By Dr. Ernest Bade.
Find the Hair—Find the Criminal 984
By Mel Wharton.
Science in Pictures..... 985
The Living Death..... 986
By John Martin Leahy.
"Death Ray" in Movies..... 988
Poison Gas Shells..... 989
By Lieut. Robert E. Sadtler, U. S. A.
Dr. Hackensaw's Secrets..... 990
By Clement Fezandié.
Everyday Chemistry 992
By Ramond B. Wailes.
Glands Assist Evolution..... 993
Safety Razor Blade Gives 400 Shaves 993
Science of Christmas Toys..... 994
By Joseph H. Kraus.
Stereoscopic Movies 996
Phosphorescence 997
By Raymond B. Wailes.
Specialized Closets 998
By William M. Butterfield.
Stunts for the Smoker..... 999
By Walter B. Gibson.
How We Digest Food..... 1000
By Ismar Ginsberg, B. Sc. Chem. Eng.
Magic for Everybody..... 1001
By Prof. Joseph Dunninger.
Soap Doll Actor..... 1002
More Gamblers' Tricks Exposed... 1003
By Mark Mellen.

PRIZE CONTESTS

How-to-Make-It Department—$30.00 in Prizes..... 1007
Scientific Humor—Prizes for Best Jokes 1021
Awards in $1000 Monthly Contest 1024

AUTOMOBILES

Automatic Railroad Crossing Gate. 977
English Tire 1002
Building an Auto Speedster..... 1004
By George Arthur Luers.

ELECTRICITY

"Shipwrecked" on Stage..... 974
The Radio Teledactyl..... 978
Portable Electrocardiograph 979
Latest Patents 1020
Oracle 1022
Patent Advice 1034
Edited by A. P. Peck.

RADIO ARTICLES

The Radio Teledactyl 978
Radio Pictorial 1010
A New One—WGBS..... 1011
Photos Across the Atlantic..... 1012
By Leon L. Adelman.
Broadcasting from the Clouds.... 1014
Capabilities of Your Receiving Set 1014
A 100-Foot Antenna Mast..... 1015
By Fred A. Parsons, 2ABM.
A Low Loss Broadcast Receiver... 1016
By Frank Frimerman, 2FZ.
Three Good Circuits..... 1017
Radio Oracle 1018

CONSTRUCTOR ARTICLES

How to Build an Auto Speedster.. 1004
By George Arthur Luers.
An Emergency Foot Bridge..... 1006
Small Microscope From Glass Beads 1006

CHEMISTRY ARTICLES

Find the Hair—Find the Criminal 984
By Mel Wharton.
Poison Gas Shells..... 989
By Lieut. Robert E. Sadtler, U. S. A.
Everyday Chemistry 992
By Raymond B. Wailes.
Phosphorescence 997
How We Digest Food..... 1000
By Ismar Ginsberg, B. Sc.
Wrinkles, Recipes and Formulas.. 1008

ASTRONOMY ARTICLES

Viewing Mars From Mountain Top 976
The Artificial Star..... 996

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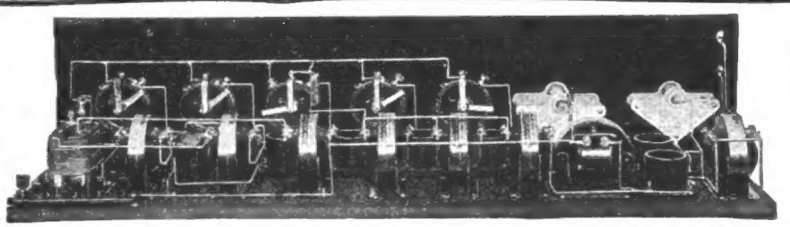

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1 Connecticut Filament Switch
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2 Bakelite 30-ohm
1 Bakelite Potentiometer, 400 ohms
1 Carter Double Circuit Jack
1 Dubilier 1 mfd. Condenser
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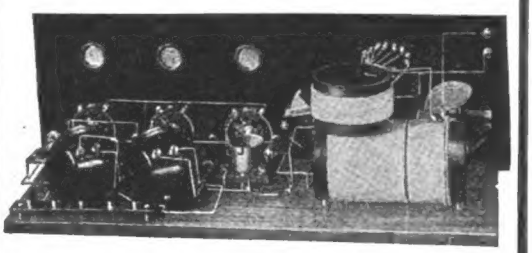

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2 3 in. Bakelite Dials.
1 Grid Leak and Mica Cond.
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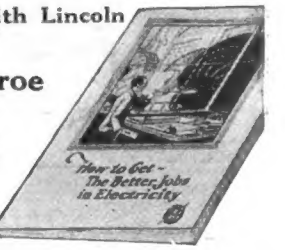

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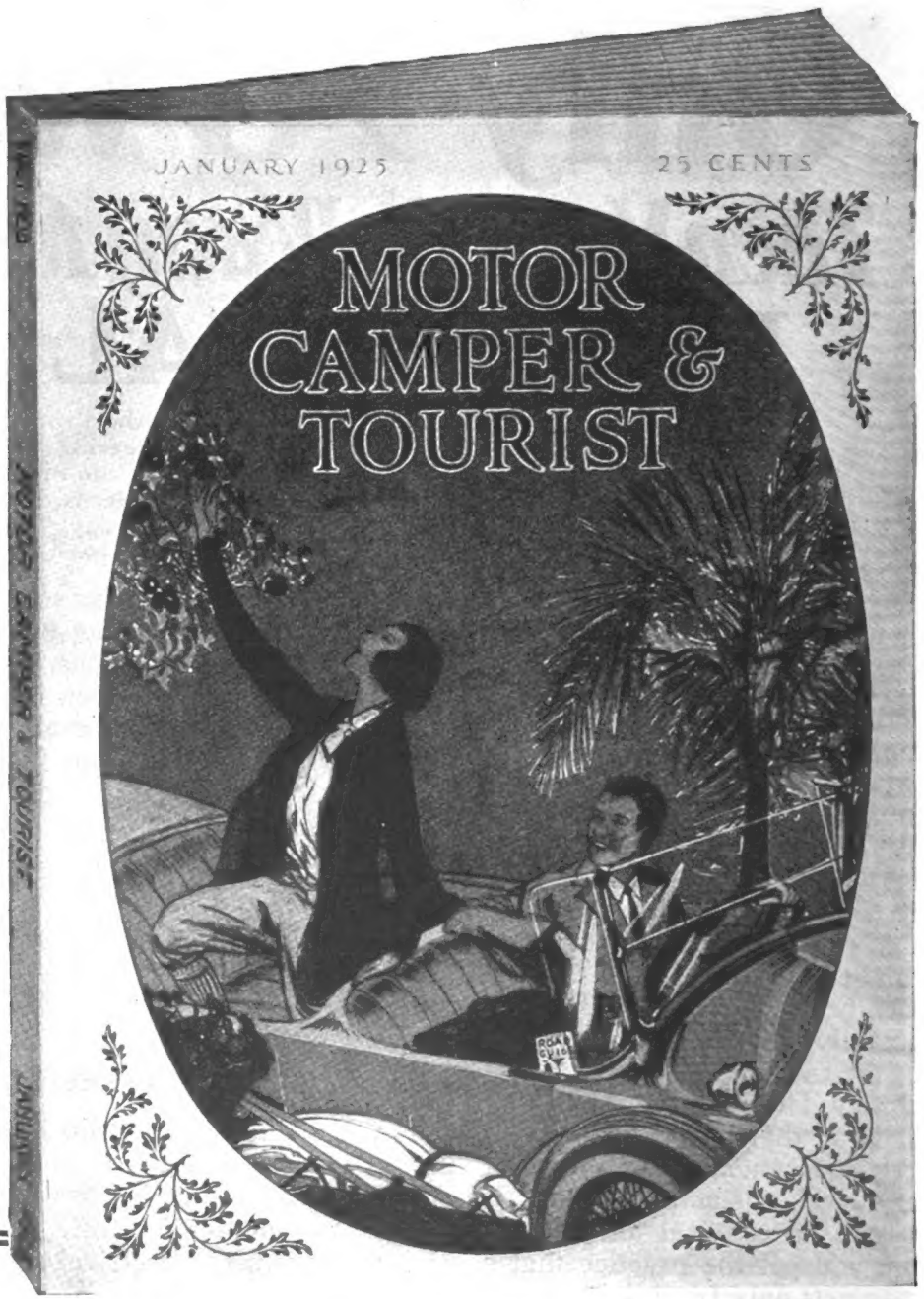

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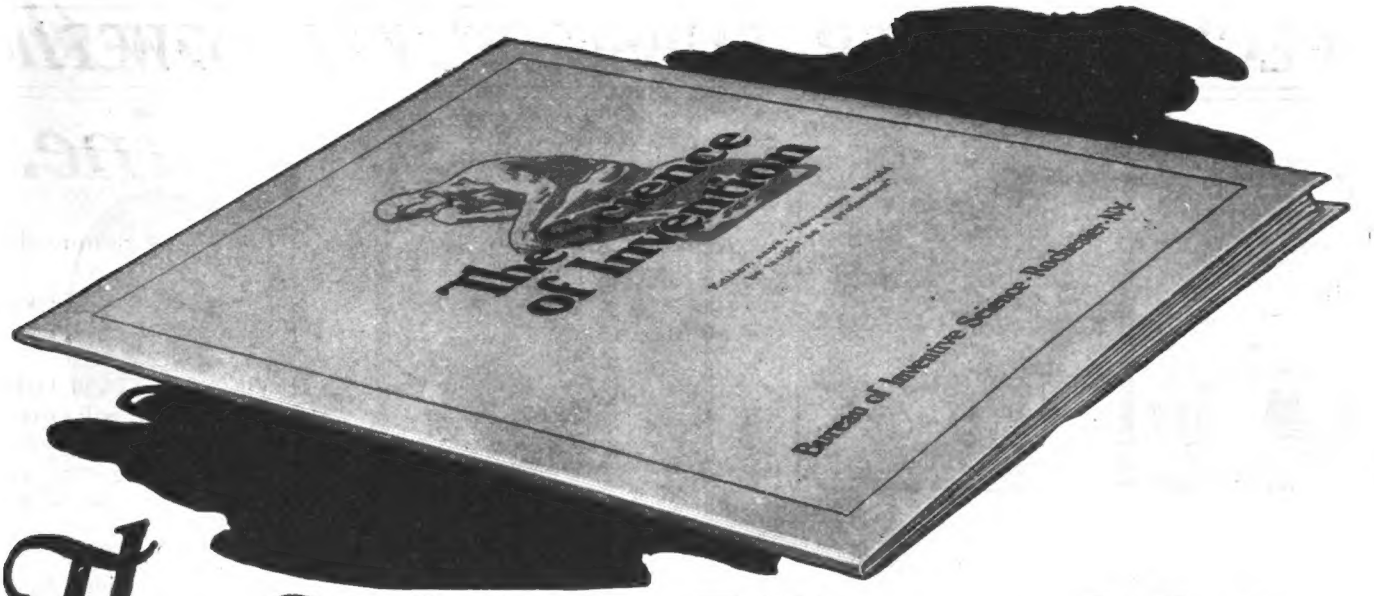

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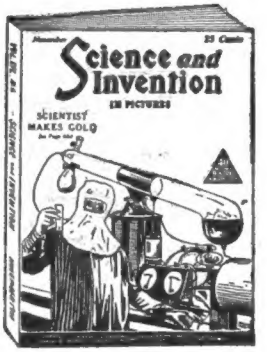

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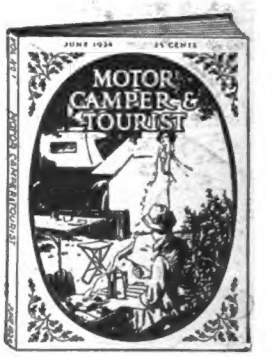

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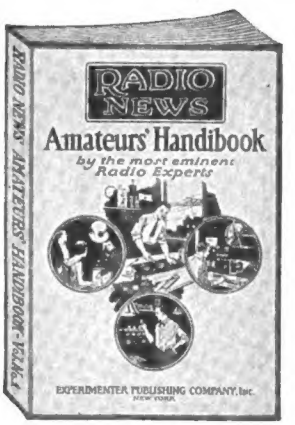

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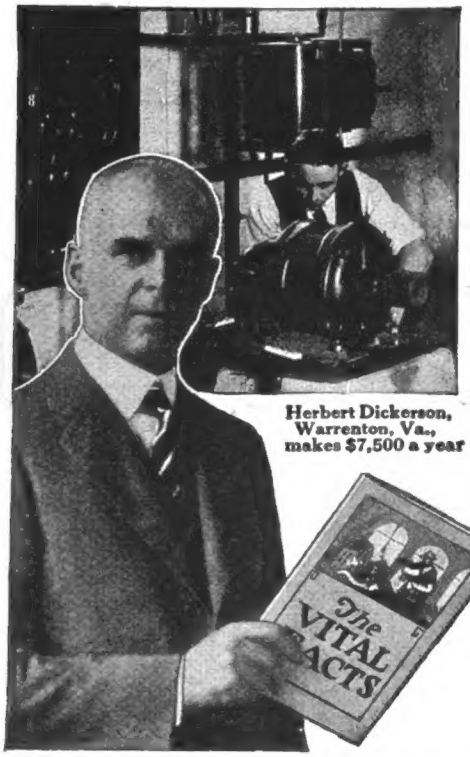

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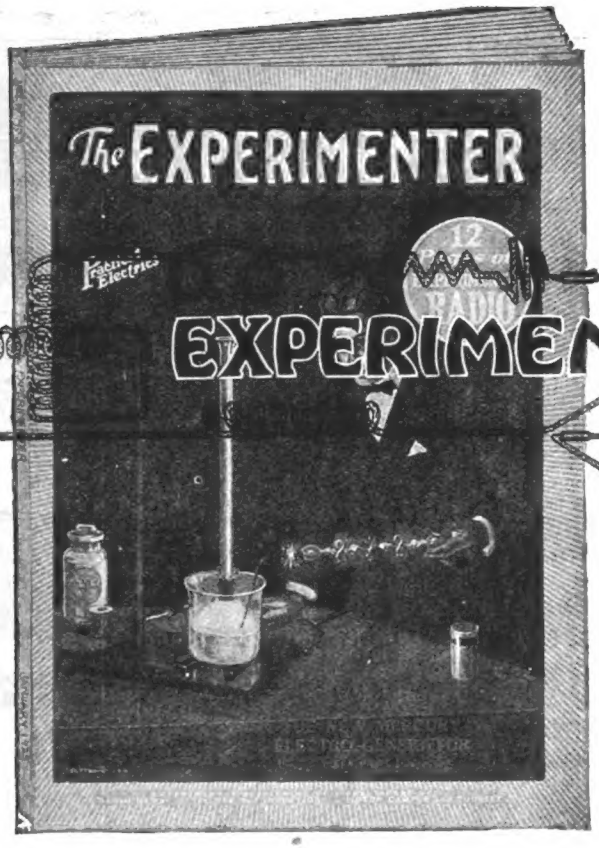

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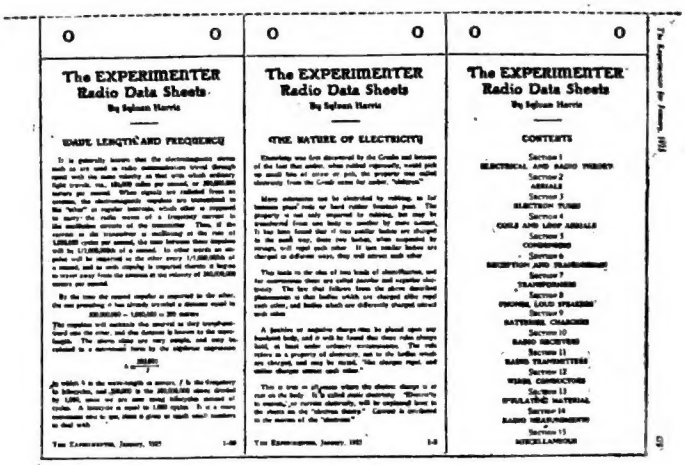

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EXPERIMENTING as a PROFESSION

By HUGO GERNSBACK

The following extracts from Mr. Gernsback's editorial in the JANUARY issue of the *Experimenter* will give you an idea of the possibilities in store for the radio experimenter.

"Many of our readers experiment as a sort of hobby, for pleasure or instruction, but comparatively few realize that an experimenter may capitalize his work. Nevertheless, the writer is convinced of this, and he believes that he can readily show you that there is money in independent work of this character."

"In the radio business, particularly, there is today a vast field for experimental work. There is not a radio corporation worth its salt, that could not employ a few more radio investigators to develop a hook-up or a design, or what not."

"To make this clear, a large New York manufacturer of radio sets recently called upon the writer to furnish three experimental research men to perfect a certain set. These people had purchased a patent from an inventor who, however, did not know anything about the commercial work, nor could he make the set work where more than one tube was used. The one tube set worked very well, but the company wanted to produce a four tube set. Wouldn't the writer supply or suggest men to do the experimental work to develop such a set?"

SPECIAL FEATURE—JANUARY ISSUE
EXPERIMENTAL HARMONICS
By JOHN L. REINARTZ

John L. Reinartz, one of radio's greatest designers and experimenters has a live, up-to-the-minute article in the January issue of the EXPERIMENTER on his experiments with Harmonics. In a newsy, interesting way he describes his activities and the results of his test. They show how an experienced experimenter goes about his work.

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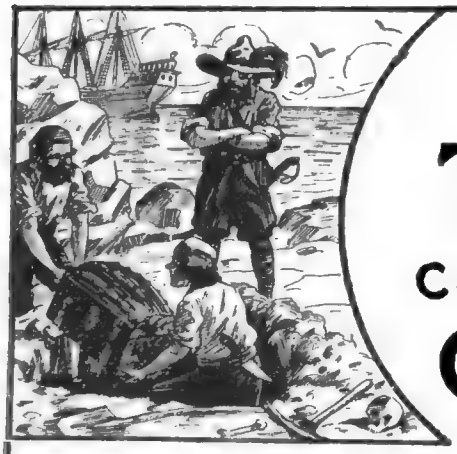

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T. O'CONOR SLOANE, A.B., A.M., LL.D., Ph.D.
Noted Instructor, Lecturer and Author. Formerly Treasurer American Chemical Society and a practical chemist with many well known achievements to his credit. Not only has Dr. Sloane taught chemistry for years but he was for many years engaged in commercial chemistry work.

Do you remember how the tales of pirate gold used to fire your imagination and make you want to sail the uncharted seas in search of treasure and adventure? And then you would regret that such things were no longer done. But that is a mistake. They *are* done—today and everyday—not on desert islands, but in the chemical laboratories throughout your own country. Quietly, systematically, the chemist works. His work is difficult, but more adventurous than the blood-curdling deeds of the Spanish Main. Instead of meeting an early and violent death on some forgotten shore, he gathers wealth and honor through his invaluable contributions to humanity. Alfred Nobel, the Swedish chemist who invented dynamite, made so many millions that the income alone from his bequests provides five $40,000 prizes every year for the advancement of science and peace. C. M. Hall, the chemist who discovered how to manufacture aluminum made millions through this discovery. F. G. Cottrell, who devised a valuable process for recovering the waste from flue gases, James Gayley, who showed how to save enormous losses in steel manufacture, L. H. Baekeland, who invented Bakelite—these are only a few of the men to whom fortunes have come through their chemical achievements.

What Some of Our Students Say of This Course:

I have not written since I received the big set. I can still say that it far exceeded my anticipations. Since I have been studying with your school I have been appointed chemist for the Scranton Coal Co. testing all the coal and ash by proximate analysis. The lessons are helping me wonderfully, and the interesting way in which they are written makes me wait patiently for each lesson.—MORLAIS COUZENS.

I wish to express my appreciation of your prompt reply to my letter and to the recommendation to the General Electric Co. I intend to start the student engineering course at the works. This is somewhat along electrical lines, but the fact that I had a recommendation from a reliable school no doubt had considerable influence in helping me to secure the job.—H. VAN BENTHUYSEN.

So far I've been more than pleased with your course and am still doing nicely. I hope to be your honor graduate this year.—J. M. NORKUS, JR.

I find your course excellent and your instruction, truthfully, the clearest and best assembled I have ever taken, and yours is the fifth one I've studied.—JAMES J. KELLY.

From the time I was having Chemistry it has never been thus explained to me as it is now. I am recommending you highly to my friends, and urging them to become members of such an organization.—CHARLES BENJAMIN.

I shall always recommend your school to my friends and let them know how simple your lessons are.—C. J. AMDAHL.

I am more than pleased. You dig right in from the start. I am going to get somewhere with this course. I am so glad that I found you.—A. A. CAMERON.

I use your lessons constantly as I find it more thorough than most text books I can secure.—WM. H. TIBBS.

Thanking you for your lessons, which I find not only clear and concise, but wonderfully interesting. I am—ROBT. H. TRAYLOR.

I received employment in the Consolidated Gas. Co. I appreciate very much the good service of the school when a recommendation was asked for.—JOS. DECKER.

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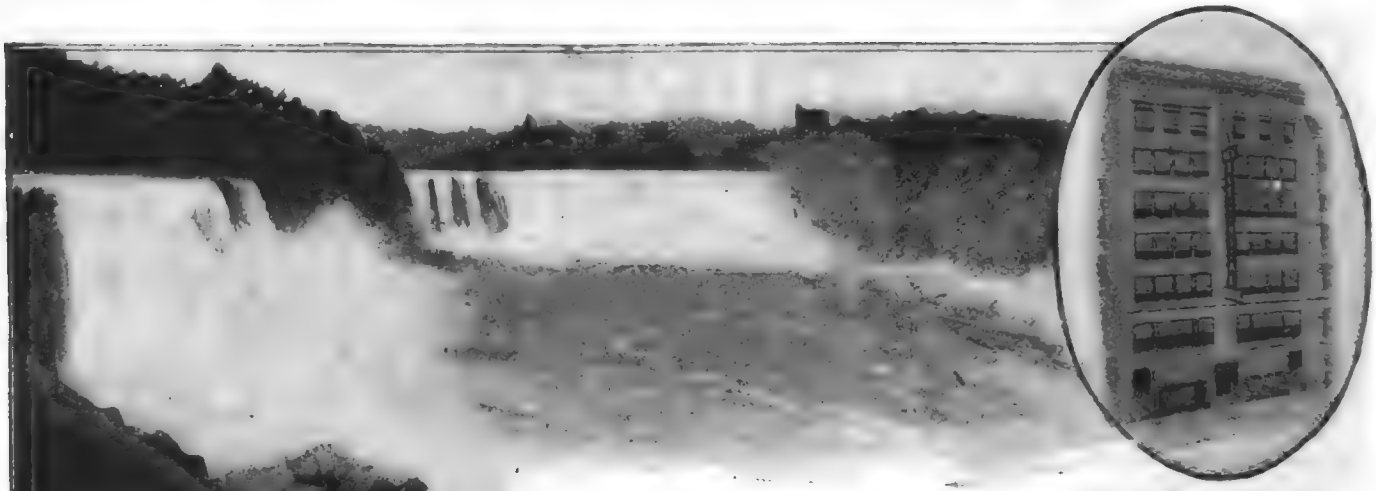

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Volume XII
Whole No. 142

Science and Invention

Feb., 1925
No. 10

H. GERNSBACK, EDITOR AND PUBLISHER
H. WINFIELD SECOR, ASSOCIATE EDITOR
T. O'CONOR SLOANE, Ph.D., ASSOCIATE EDITOR

Editorial and General Offices, - - - 53 Park Place, New York

"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact" - - - HUXLEY

Needed Inventions

By HUGO GERNSBACK

EVERY so often we run across some new little item that seems to be in everybody's household, or in everybody's possession, and often the inventor of the article has reaped a small fortune, and sometimes a big one, from the idea. And ever so often, the writer receives requests from readers who wish to know on what they should try their inventive ingenuity, in order to devise something of use and merit.

There are, of course, many thousands of things that can be invented, by almost everyone, during the year. The difference between inventing an article and putting it on the market and selling it successfully is usually found in the practicability of the device and how much it is actually needed and wanted by people.

I BELIEVE THAT:
To be a good inventor you must be an excellent observer.

PENCIL ERASER. This is a good illustration of the above. Everybody makes mistakes, and everybody, therefore, needs an eraser badly. The man who invented the rubber eraser most assuredly was a genius of the first calibre. And while the rubber eraser still persists and will be used for many years to come, we need today a different sort of an eraser, for several reasons. Where black lead is used, the rubber eraser is excellent, but we are now coming into an era of colored pencils, and we find that the rubber eraser no longer serves. Try to use the rubber eraser on colored pencil lines and you usually make a mess of it. Furthermore, the fountain pen is now used almost as much as, or perhaps more than, the pencil. No one has as yet succeeded in making a good and simple fountain pen or colored pencil eraser. What is needed is a simple chemical or mechanical eraser to cover these two crying needs.

UMBRELLA SUBSTITUTE. Before you leave your home in the morning, your daily paper assures you that it will be fair for the day. But when you come from lunch, you find that it is raining "cats and dogs." Of course, you have no umbrella, not having anticipated rain. So you stand under a doorway and wait for the rain to stop—which it may or may not do. So you skip through the rain and arrive at the office soaked to the skin. What is the remedy? There should be a simple, light contrivance that can be placed in the inside of every hat, or carried conveniently in the pocket. It can be made of oiled or prepared silk in such a manner that, when unfolded, it will cover one from head to foot. Being transparent, we can look through it and see where we are going. The article would have the shape of a huge rubber finger, such as you buy in drug stores, big enough to cover your hat and go down to the ankle. It would cover the arms as well. It should sell for about $2, and need not weigh more than two ounces.

I BELIEVE THAT:
in time to come, inventing will be recognized as a regular profession.

COLLAR PRESERVER. When your collars come back from the laundry, you feel, as a rule, like selling them to your hardware store, because the edges make excellent saws. A recent laboratory report shows that we do not *wear* out our collars. Instead, the laundry wears them out for us. It would seem that in up-turned or turn-downed collars the constant bending and unbending and running of the collar between hot laundering rollers breaks the fabric at the edges hence the saw edges. This is where our inventors should get busy. A reinforcement of some sort, in a different kind of material from linen, would, perhaps, solve the problem. The writer does not know whether silk was ever tried, but there must be some material that can be made to stand the wear; or perhaps an arrangement might be invented whereby a new edge could be inserted by the laundry people every time the collar is laundered; because we all know that it is not the entire collar that wears out, but only the edge. Hence, we have to throw away collars 99.5% in good condition, simply because a small fraction has worn out.

WINDOW CLOSER. Your wife and you take a stroll along the avenue, or you are visiting at your friends, when suddenly, for no reason at all, it starts to rain. The lady of the house immediately gets a case of nerves, because she remembers that the parlor window has been left open, and, sure enough, the rain is coming from that side. The new sofa and the new rug will certainly be ruined. This happens to all of us, but so far no inventors have thought of and constructed a practical automatic window closer that shuts down immediately the rain starts falling. To be sure, there have been patents of this kind galore, but somehow or other they could not have been very good, because the idea has never been adopted in practice. First, the article has to be cheap, so that anyone can install it for *any* window. Second, it must always be ready to act; and third, it must not take up a great deal of space. There have been proposed articles of this kind constructed with thin blotting paper or tissue paper, the idea being that as soon as the water softened these, a trip would immediately release and a weight would close the window. The trouble with some of these devices was that a strong wind would do the same thing. Here is a good item which, when worked out satisfactorily, should be used by every householder the world over.

I BELIEVE THAT:
the prime requisite of the inventor must be everlasting perseverance.

BILL RENOVATOR. It costs the United States Treasury untold thousands to renovate our paper money bills every year. Most of the bills are really not so old that they could not be cleaned by some chemical or mechanical means, and every bank would welcome such a machine. You put the dirty, crumpled ten-dollar bill in one end, and out it comes, laundered, crisp and like new from the other. To be sure, there are some such machines in existence, but seemingly they have not been entirely successful, because as yet not every bank uses them. The machine the writer has in mind should be a simple affair that could be sold for less than $50. It would contain a chemical tank in which the bill is soaked, then another cleansing tank through which it is run, finally to emerge, clean and dry, after being ironed out by two electrically-heated rollers. The whole machine need not be larger than a foot square and a foot high. There is a demand for such a machine.

ADVICE. The thing that the inventor should bear in mind when he becomes imbued with a new idea is that it is one thing to have a good idea, and quite another to patent that idea and make money out of it. Before spending hard-earned money on models and development of a given idea, the would-be inventor should first find out what has been accomplished in the same line before. The easiest way to do so is to get in touch with a good patent attorney who, for a small sum, will be glad to make a patent search among similar devices. This always saves money in the end.

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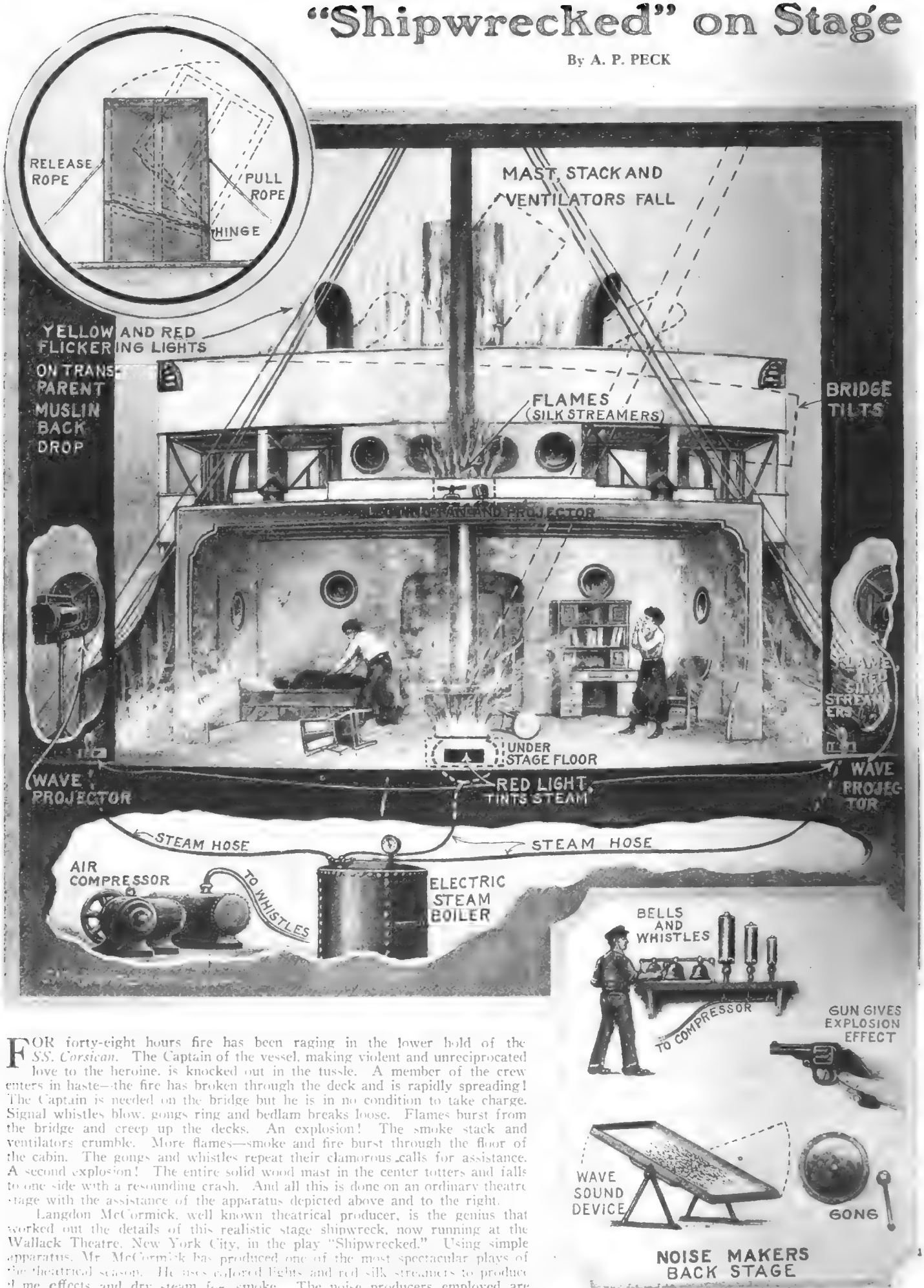
"Shipwrecked" on Stage

By A. P. PECK



FOR forty-eight hours fire has been raging in the lower hold of the *SS. Corsican*. The Captain of the vessel, making violent and unreciprocated love to the heroine, is knocked out in the tussle. A member of the crew enters in haste—the fire has broken through the deck and is rapidly spreading! The Captain is needed on the bridge but he is in no condition to take charge. Signal whistles blow, gongs ring and bedlam breaks loose. Flames burst from the bridge and creep up the decks. An explosion! The smoke stack and ventilators crumble. More flames—smoke and fire burst through the floor of the cabin. The gongs and whistles repeat their clamorous calls for assistance. A second explosion! The entire solid wood mast in the center totters and falls to one side with a resounding crash. And all this is done on an ordinary theatre stage with the assistance of the apparatus depicted above and to the right.

Langdon McCormick, well known theatrical producer, is the genius that worked out the details of this realistic stage shipwreck, now running at the Wallack Theatre, New York City, in the play "Shipwrecked." Using simple apparatus, Mr. McCormick has produced one of the most spectacular plays of the theatrical season. He uses colored lights and red silk streamers to produce flame effects and dry steam for smoke. The noise producers employed are illustrated at the right

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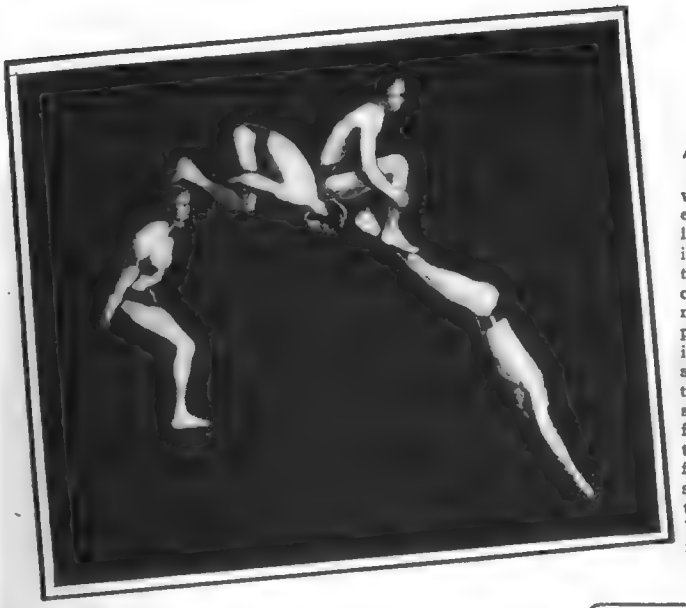
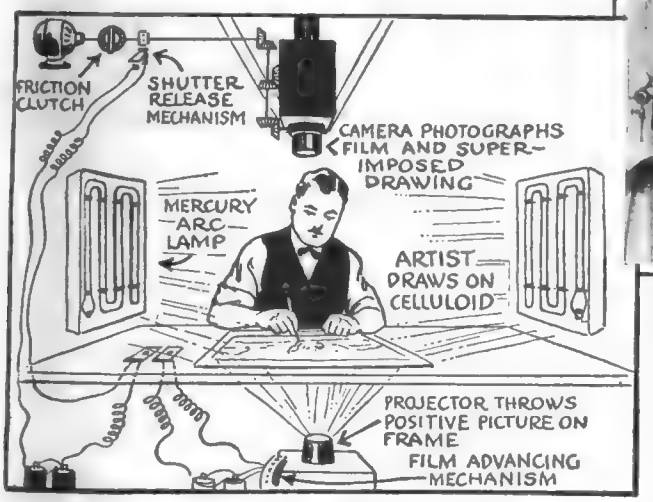
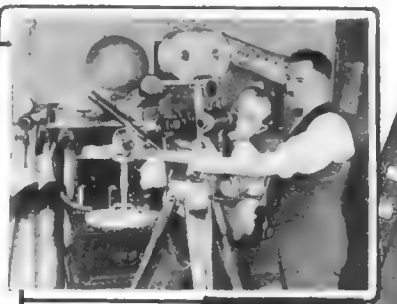
Movie Film Duplicates Figures

THE latest development in motion picture photography is the duplication of figures while the object is in motion, by means of either line drawings or photographs. At the left is an enlargement of a frame of the moving picture film. The man is seen to leave the spring board and go through the acrobatics of his dive. In mid-air, however, his figure remains impressed on the film, and as he passes from one movement to another, an impression of his previous positions is constantly maintained until the dive is over; these figures remaining in view for the sake of comparison instruct in the performance of the dive to a degree heretofore unexcelled. The photographic figures can be replaced by outline sketches, as illustrated elsewhere on this page. The process is a combination of the Novagraph or slow motion picture and Max Fleisher's cartoons. —H. Winfield Secor.

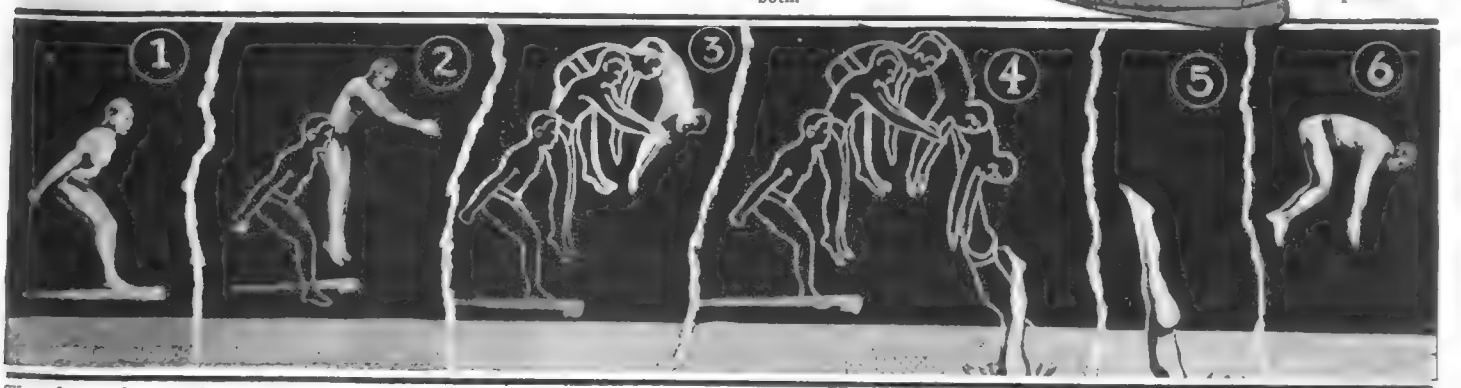






The diagram at the left illustrates how these pictures are made. A picture projected upwards from below enables the artist to properly make his line sketches. The camera photographs the drawing or image, or both.

The illustration above shows what a film looks like with a number of these images upon it. The mask is used for blocking out all of the film with the exception of that part upon which the photograph is to be impressed.

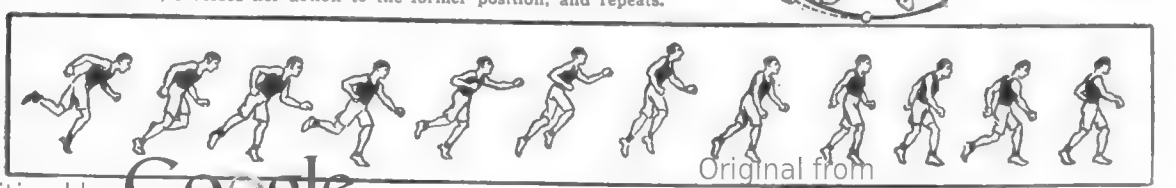


The above photographs are taken from another analysis film. In No. 1 the diver is just about to leave a spring board. As he reaches position No. 2, an outline figure remains at his first position. At any time the diver can be made to come back from Fig. 5 to 6, and continue the dive from that position.

The system may be used to combine slow motion with a regulation speed movement. Let us assume that we have an individual making a broad jump as shown at the right. He runs at full speed to the taking-off place where his action gradually slows up until he is scarcely moving.

The action in the film may be repeated and reversed at any point as indicated above, where a dancer leaps into the air, crosses her legs, starts to descend, reverses her action to the former position, and repeats.

The best golfers teach that the upward stroke of the club should be the same as the downward stroke. A thin line which seems to leave the club as it moves indicates that the golfers do not practise what they preach.



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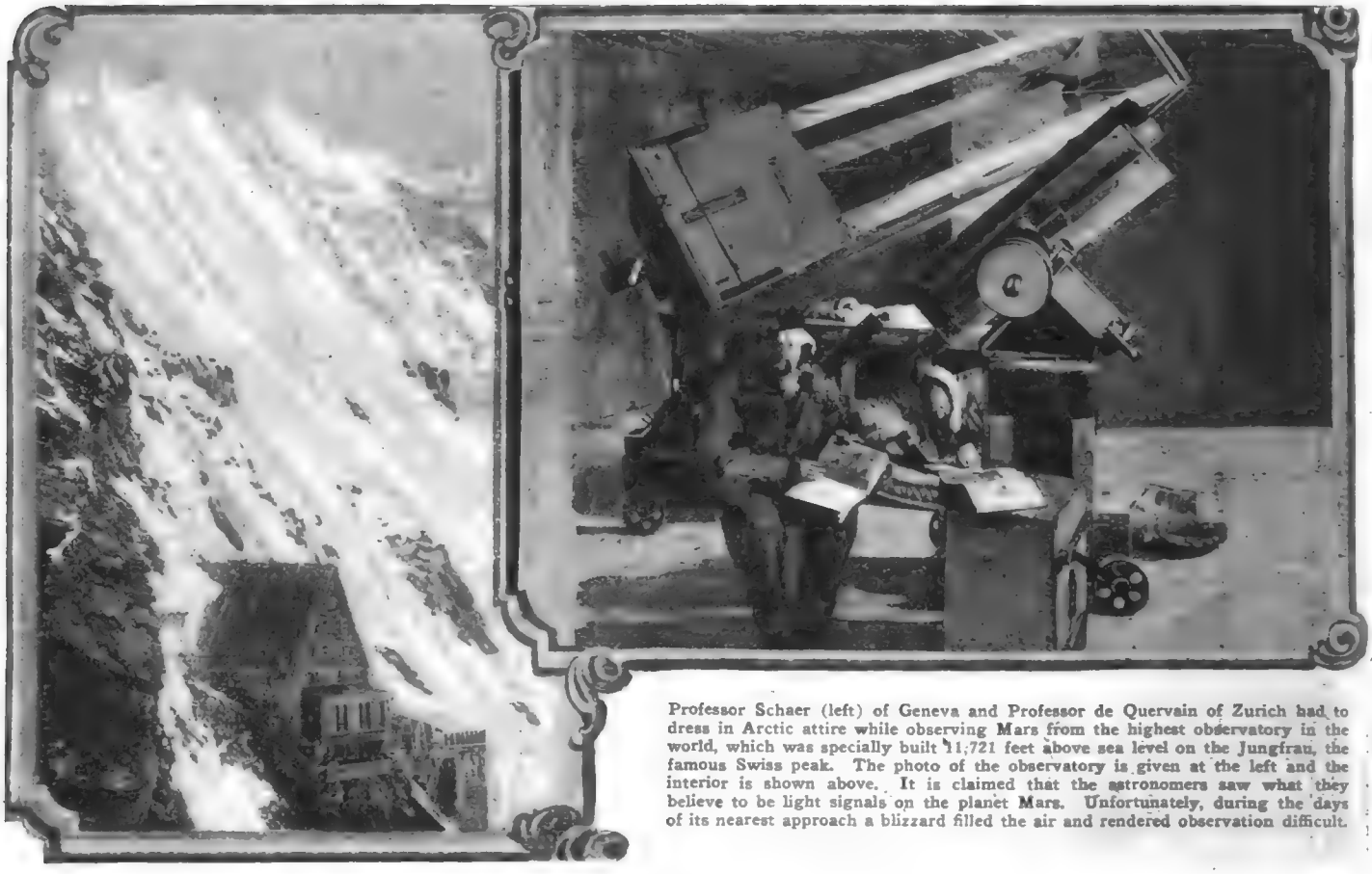
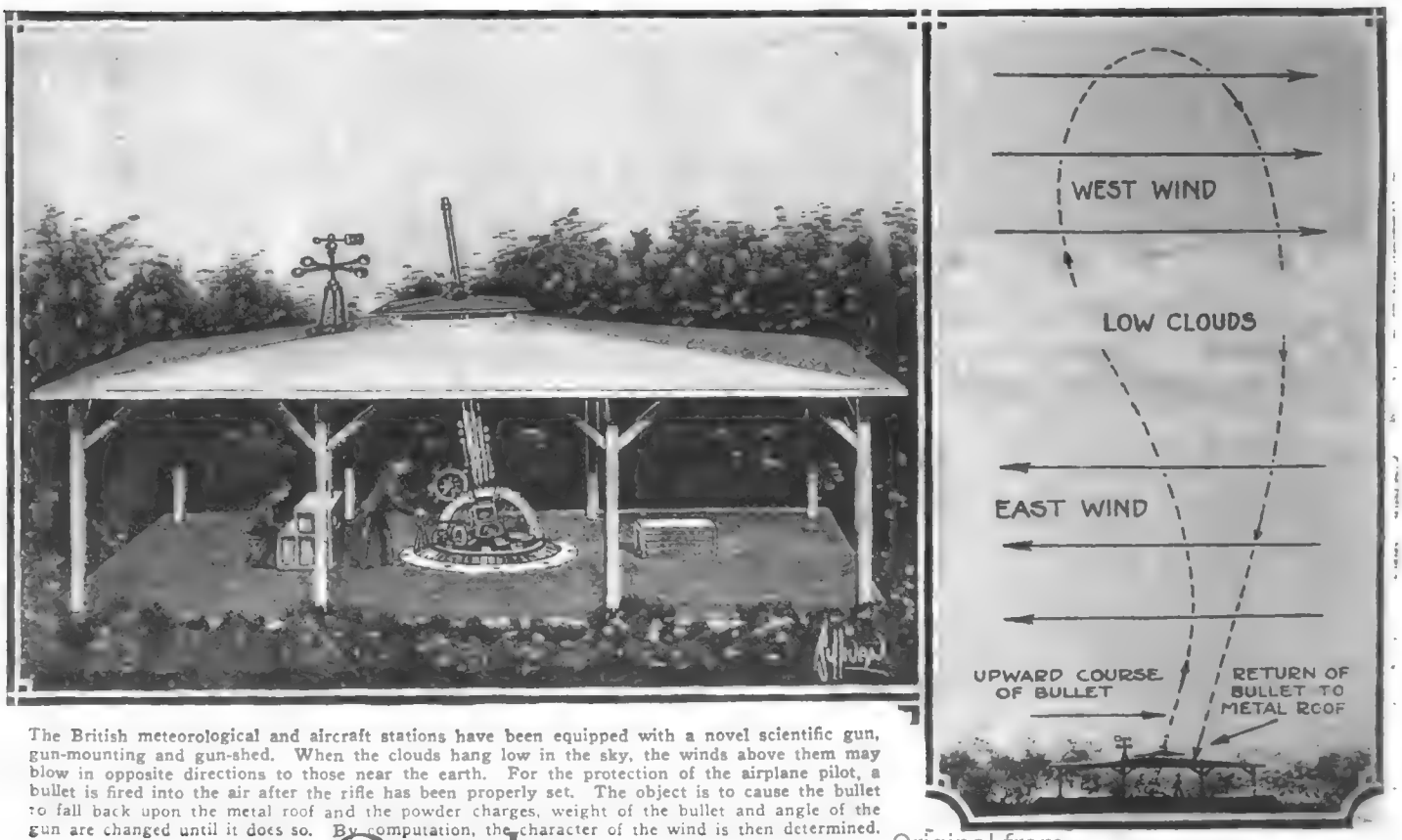
Viewing Mars from Mountain Top



Professor Schaer (left) of Geneva and Professor de Quervain of Zurich had to dress in Arctic attire while observing Mars from the highest observatory in the world, which was specially built 11,721 feet above sea level on the Jungfrau, the famous Swiss peak. The photo of the observatory is given at the left and the interior is shown above. It is claimed that the astronomers saw what they believe to be light signals on the planet Mars. Unfortunately, during the days of its nearest approach a blizzard filled the air and rendered observation difficult.

Shooting the Air to Test Wind

By ERNEST BRENNECKE



The British meteorological and aircraft stations have been equipped with a novel scientific gun, gun-mounting and gun-shed. When the clouds hang low in the sky, the winds above them may blow in opposite directions to those near the earth. For the protection of the airplane pilot, a bullet is fired into the air after the rifle has been properly set. The object is to cause the bullet to fall back upon the metal roof and the powder charges, weight of the bullet and angle of the gun are changed until it does so. By computation, the character of the wind is then determined.

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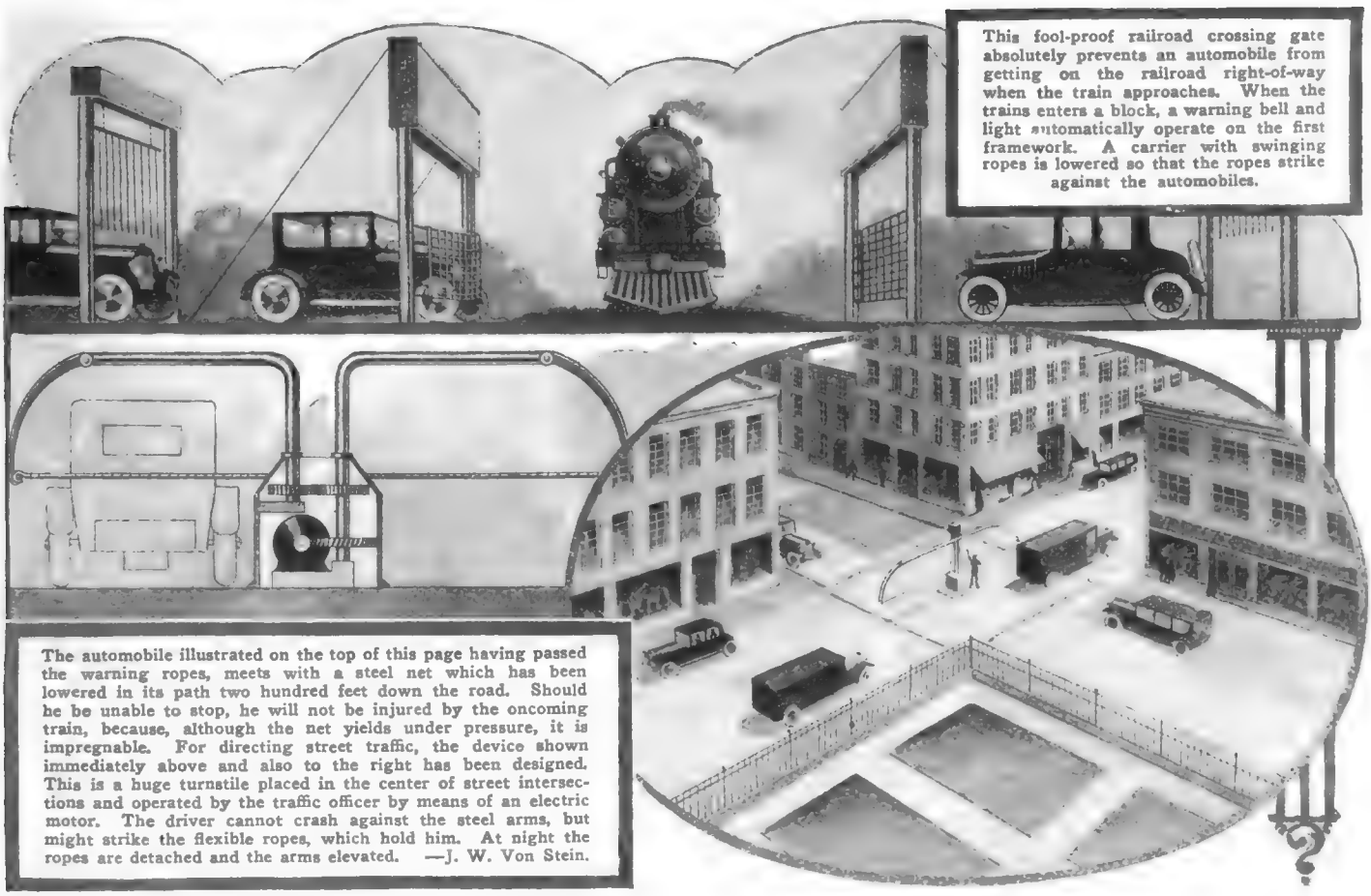
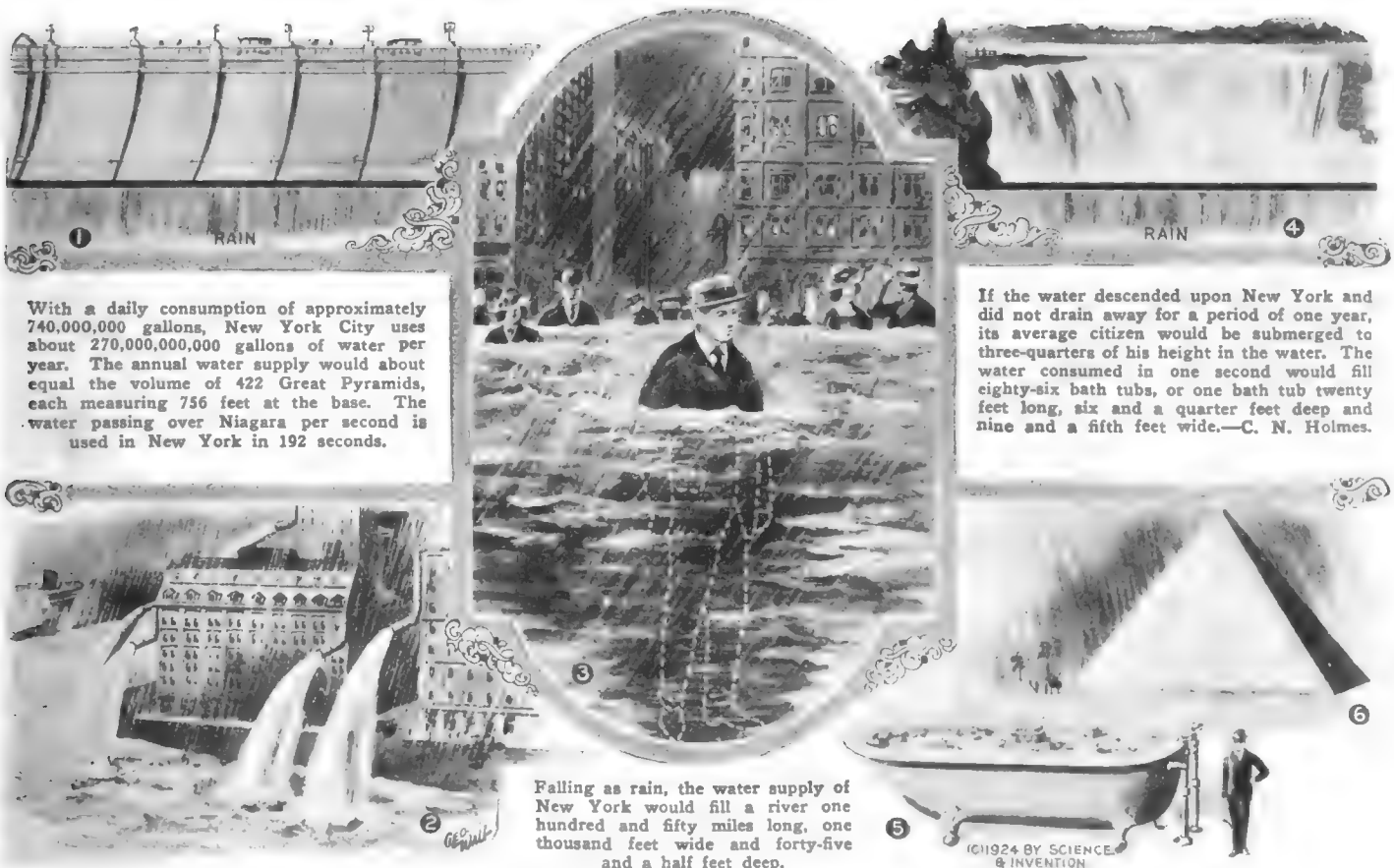
Automatic Railroad Crossing Gate



This fool-proof railroad crossing gate absolutely prevents an automobile from getting on the railroad right-of-way when the train approaches. When the trains enters a block, a warning bell and light automatically operate on the first framework. A carrier with swinging ropes is lowered so that the ropes strike against the automobiles.

The automobile illustrated on the top of this page having passed the warning ropes, meets with a steel net which has been lowered in its path two hundred feet down the road. Should he be unable to stop, he will not be injured by the oncoming train, because, although the net yields under pressure, it is impregnable. For directing street traffic, the device shown immediately above and also to the right has been designed. This is a huge turnstile placed in the center of street intersections and operated by the traffic officer by means of an electric motor. The driver cannot crash against the steel arms, but might strike the flexible ropes, which hold him. At night the ropes are detached and the arms elevated. —J. W. Von Stein.

If N.Y. City's Water Supply Should Fall as Rain



With a daily consumption of approximately 740,000,000 gallons, New York City uses about 270,000,000,000 gallons of water per year. The annual water supply would about equal the volume of 422 Great Pyramids, each measuring 756 feet at the base. The water passing over Niagara per second is used in New York in 192 seconds.

If the water descended upon New York and did not drain away for a period of one year, its average citizen would be submerged to three-quarters of his height in the water. The water consumed in one second would fill eighty-six bath tubs, or one bath tub twenty feet long, six and a quarter feet deep and nine and a fifth feet wide.—C. N. Holmes.

Falling as rain, the water supply of New York would fill a river one hundred and fifty miles long, one thousand feet wide and forty-five and a half feet deep.

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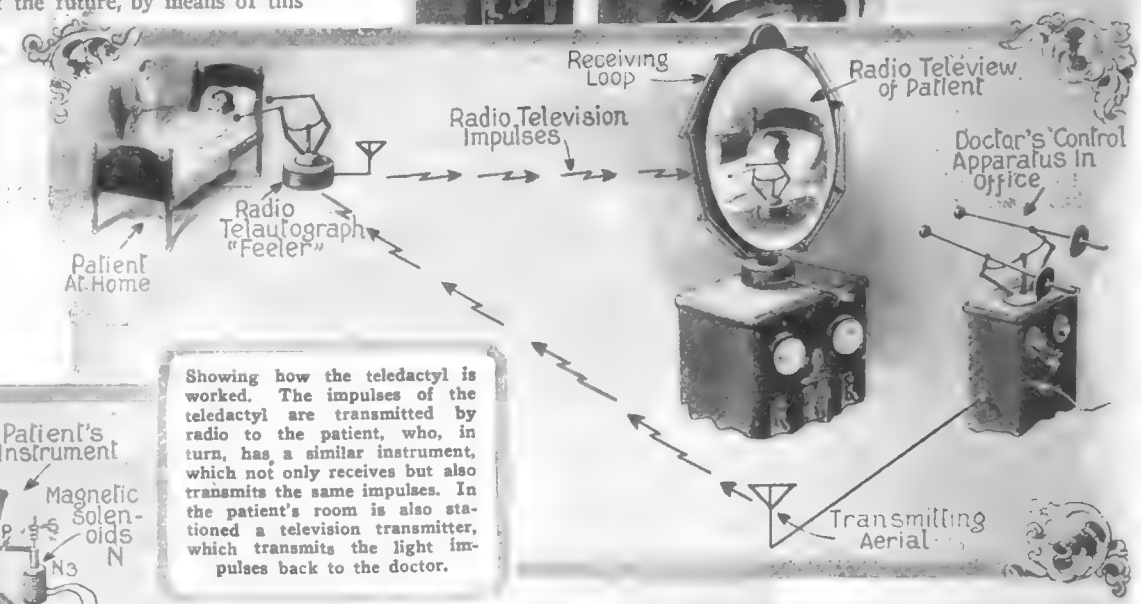
The Radio Teledactyl

By HUGO GERNSBACK
Member American Physical Society

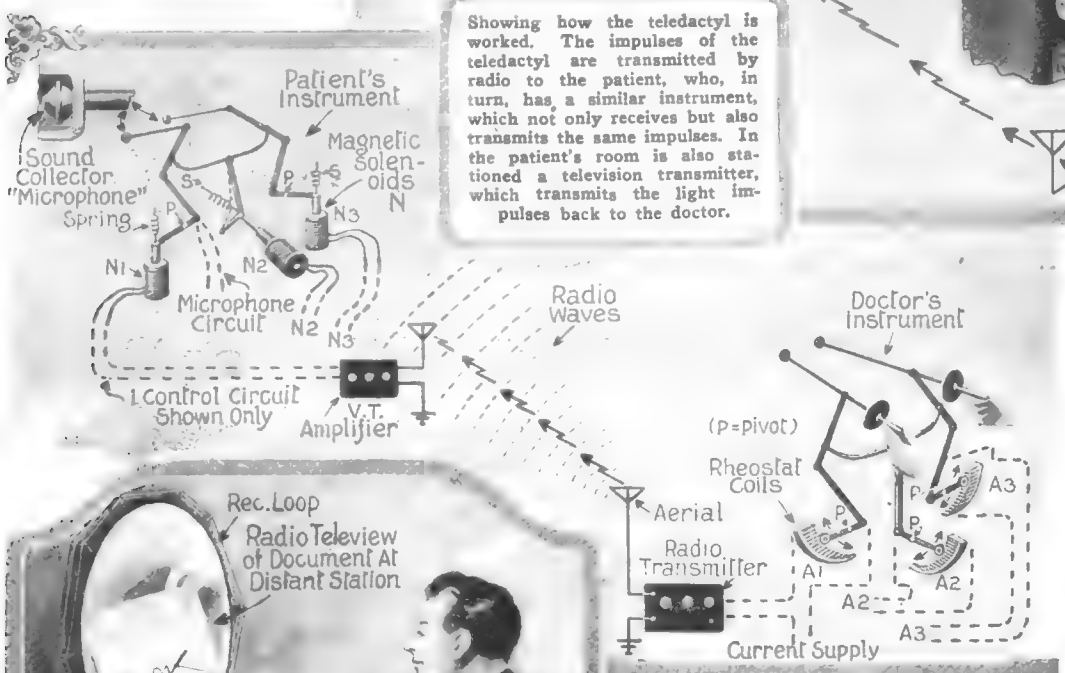
1

The Teledactyl (Tele, far; Dactyl, finger—from the Greek) is a future instrument by which it will be possible for us to "feel at a distance." This idea is not at all impossible, for the instrument can be built today with means available right now. It is simply the well known telautograph, translated into radio terms, with additional refinements. The doctor of the future, by means of this instrument, will be able to feel his patient, as it were, at a distance (see illustration to right). The doctor manipulates his controls, which are then manipulated at the patient's room in exactly the same manner. The doctor sees what is going on in the patient's room by means of a television screen. (See other captions on this page.)

Here we see the doctor of the future at work, feeling the distant patient's arm. Every move that the doctor makes with the controls is duplicated by radio at a distance. Whenever the patient's teledactyl meets with resistance, the doctor's distant controls meet with the same resistance. The distant controls are sensitive to sound and heat, all important to future diagnosis. The doctor sees what he is doing by means of the television screen in front of him.



Showing how the teledactyl is worked. The impulses of the teledactyl are transmitted by radio to the patient, who, in turn, has a similar instrument, which not only receives but also transmits the same impulses. In the patient's room is also stationed a television transmitter, which transmits the light impulses back to the doctor.



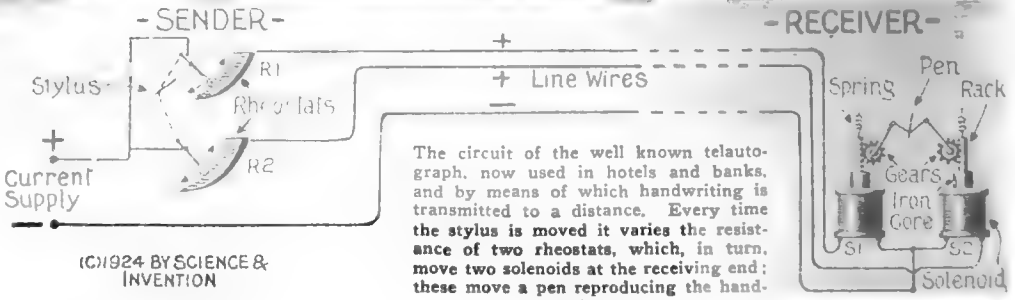
How the teledactyl operates: The teledactyl is but an improved telautograph; it works, however, in three planes, whereas the present day telautograph works in only two directions. The teledactyl is connected to a radio transmitter, which transmits the impulses; these then are received on the patient's instrument. These same impulses are then transmitted back to the doctor's instrument. The sound collector microphone is used so that the doctor at the other end can use his radio stethoscope and listen to the patient's heart-beats.

As our civilization progresses we find it more and more necessary to act at a distance. Instead of visiting our friends, we now telephone them. Instead of going to a concert, we listen to it by radio. Soon, by means of television, we can stay right at home and view a theatrical performance, hearing and seeing it. This, however, is far from sufficient. As we progress, we find our duties are multiplied and we have less and less time to transport our physical bodies in order to transact business, to amuse ourselves, and so on.

The busy doctor, fifty years hence, will not be able to visit his patients as he does now. It takes too much time, and he can only, at best, see a limited number today. Whereas the services of a really big doctor are so important that he should never have to leave his office; on the other hand, his patients cannot always come to him. This is where the teledactyl and diagnosis by radio comes in.

(*Continued on page* 1036)

Another application of the Teledactyl. Here we see the man of the future signing a check or document at a distance. By moving the control, it goes through exactly the same motions as he would in signing the document. He sees what he is doing by means of the radio televiews in front of him. The bank or other official holds the document in front of a receiving teledactyl, to which is attached a pen or other writing instrument. The document is thus signed.



The circuit of the well known telautograph, now used in hotels and banks, and by means of which handwriting is transmitted to a distance. Every time the stylus is moved it varies the resistance of two rheostats, which, in turn, move two solenoids at the receiving end; these move a pen reproducing the handwriting.

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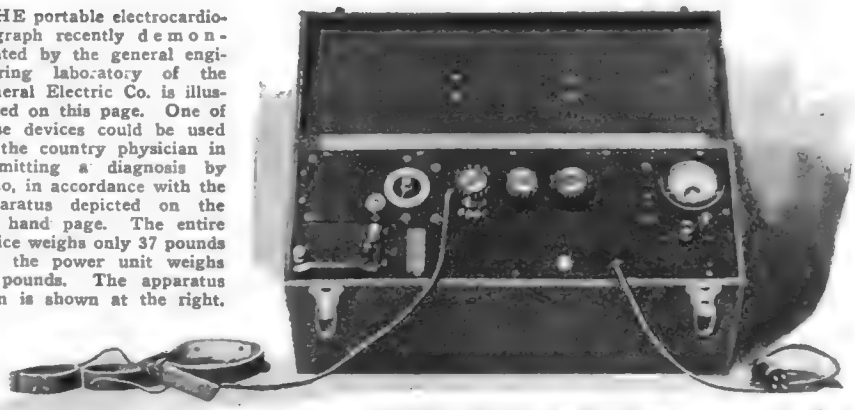
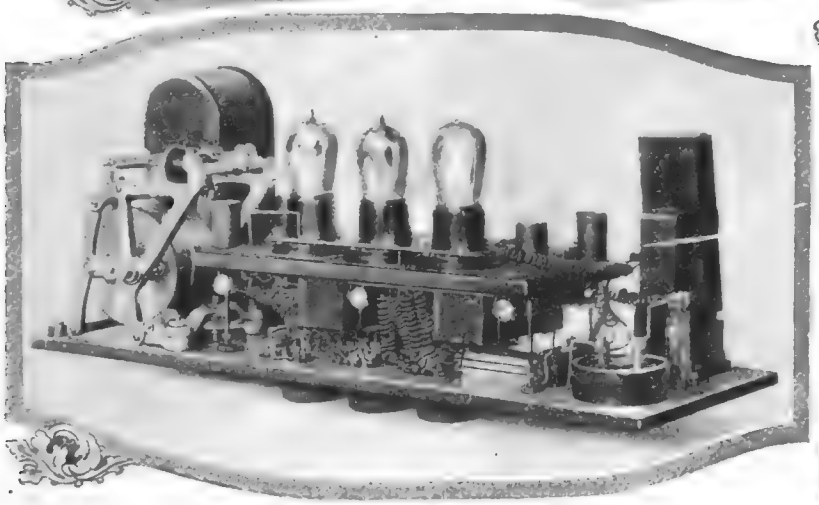
Portable Electrocardiograph

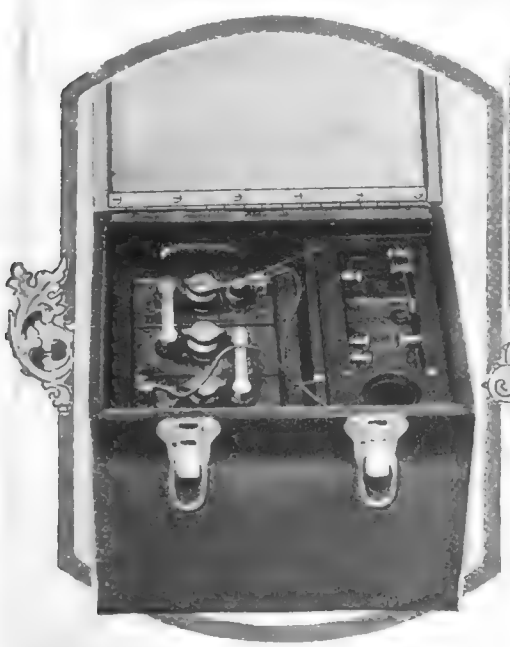
THE portable electrocardiograph recently demonstrated by the general engineering laboratory of the General Electric Co. is illustrated on this page. One of these devices could be used by the country physician in submitting a diagnosis by radio, in accordance with the apparatus depicted on the left hand page. The entire device weighs only 37 pounds and the power unit weighs 33 pounds. The apparatus open is shown at the right.





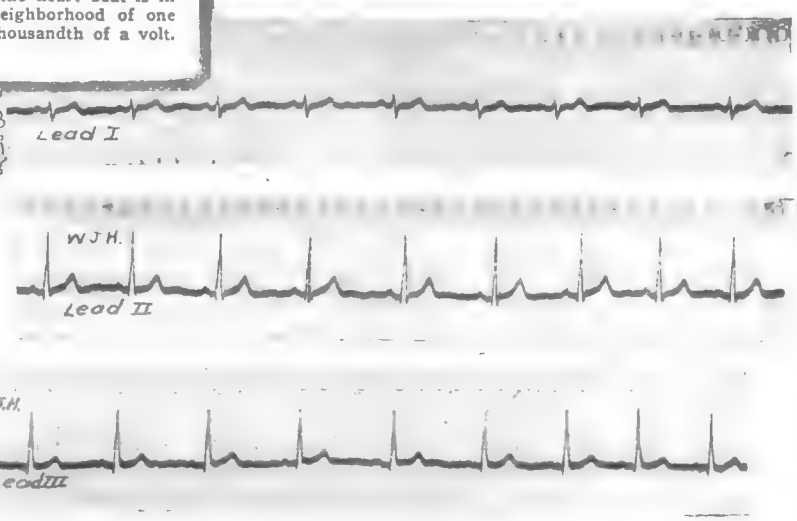
The photo above shows the portable electrocardiograph with the panel board inverted showing the vacuum tubes. In the old style cardiograph elaborate protection against vibration had to be made. Usually vibration-proof foundations were used for the mountings of these instruments. The fragile metal quartz thread used in the former apparatus is dispensed with in this construction.

A patient having a cardiogram made is depicted in the above photo. Simple metal electrodes fastened to the arms and legs of the patient are used in place of the wet sponge electrodes formerly employed. The functioning of this instrument is not affected by skin resistance. The results could be transmitted by radio to a consulting physician, telephotographically.



The power unit for the electrocardiograph is illustrated above. At the right are three typical cardiograms used for diagnosing different kinds of heart trouble taken with three different leads. They are caused by a spot of light acting on a moving film strip.

Contraction of the heart muscles is accompanied by or preceded by an electrical manifestation. This electrical change is amplified by vacuum tubes. The voltage before and after the heart beat is in the neighborhood of one one thousandth of a volt.



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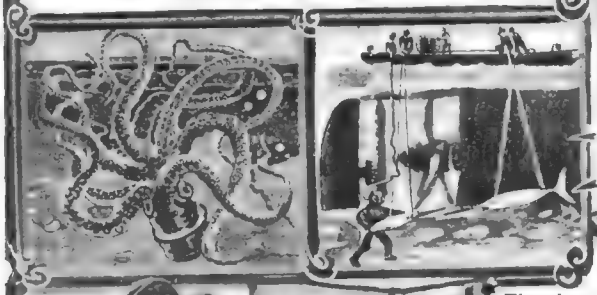
Trick Sub-Sea

By EDWIN

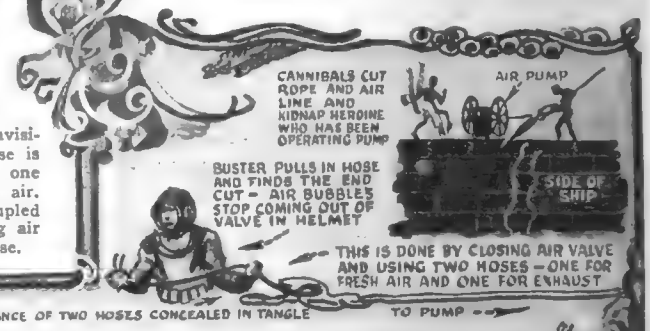
IN the Buster Keaton comedy "The Navigator," the star appears in a diving suit beneath the surface of the sea engaged in repairing a leak in the hold of a vessel which has run aground. Here he has an encounter with a swordfish and devilfish. Most of the views of his performance were actually secured at a depth of twenty feet on a small portion of the bottom of Lake Tahoe with apparatus like that illustrated on this page. In the story you behold a ship drifting out to sea with only two passengers on board, Keaton and his would-be wife. The ship runs aground off a cannibal island and springs a leak. It is at this time that Keaton dons a diving suit and goes over the side of the vessel while the girl mans the air pump. Meanwhile savages overrun the vessel, capture the girl and cut both lifelines and air hose.

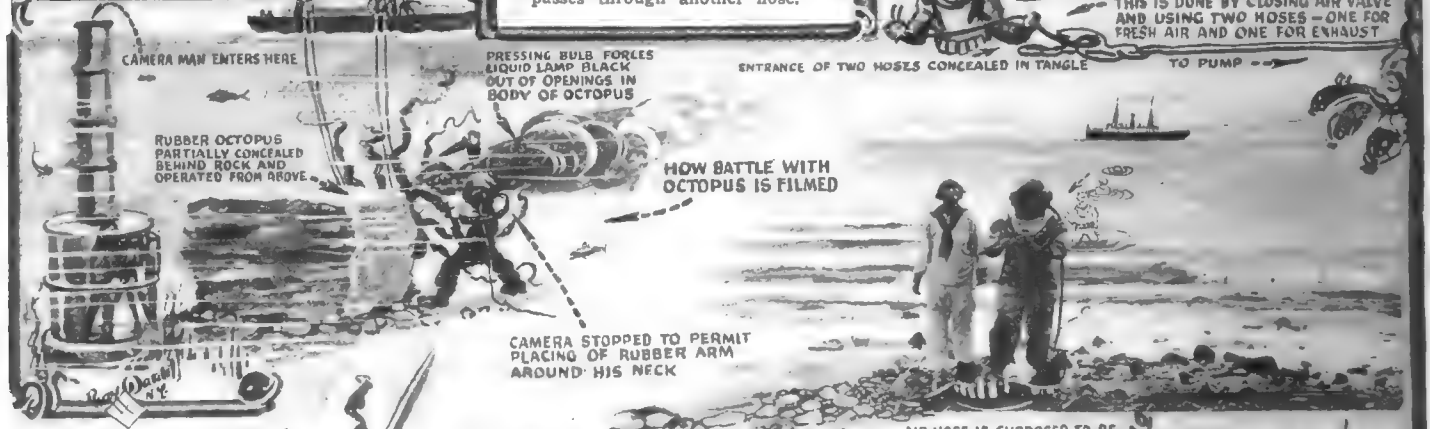
Keaton at the bottom of the sea is busy repairing the leak with a hammer and presumably wood plugs. While thus engaged a swordfish comes toward him followed immediately by another. He grasps the first one and using it as a weapon battles with the second, finally subduing it. When he realizes that his air hose has been cut, he turns off the valve at the top of his helmet and proceeds to walk toward shore. On the screen you behold him coming toward some rocks where the octopus is presumably hidden. As he approaches the rocks, a long black arm stretches forth and clasps the neck of the bronze helmet. The diver draws a knife from his belt, flourishes it above his head, and disappears behind the rocks as an inky black cloud floats upward. There are signs of a struggle and a momentary glimpse of the octopus, and then the diver emerges and continues on his way. The cost of the picture was considerably increased by the procuring of real undersea effects, but this helped to enhance the actuality of the scenes. The only scene taken in a tank in this picture was a close-up of a baby octopus with a five-foot tentacle spread.

The above photo is real undersea "shot" of Buster Keaton in a diving suit. The pail beside him is used for washing his hands. Sounds ridiculous doesn't it, but that is just why the picture is really funny. He uses a wooden mallet which floats away.



The photo above shows Keaton holding a swordfish and ready to encounter another which begins to float toward him. This is a battle to the finish. It is a good thing that the swordfish were controlled from above by quite invisible wires. When the air hose is cut as illustrated at the right, one wonders how Keaton gets his air. A second air supply hose is coupled to the cut hose, and escaping air passes through another hose.


CANNIBALS CUT ROPE AND AIR LINE AND KIDNAP HEROINE WHO HAS BEEN OPERATING PUMP
AIR PUMP
BUSTER PULLS IN HOSE AND FINDS THE END CUT — AIR BUBBLES STOP COMING OUT OF VALVE IN HELMET
SIDE OF SHIP
THIS IS DONE BY CLOSING AIR VALVE AND USING TWO HOSES — ONE FOR FRESH AIR AND ONE FOR EXHAUST
ENTRANCE OF TWO HOSES CONCEALED IN TANGLE
TO PUMP


CAMERA MAN ENTERS HERE
PRESSING BULB FORCES LIQUID LAMP BLACK OUT OF OPENINGS IN BODY OF OCTOPUS
RUBBER OCTOPUS PARTIALLY CONCEALED BEHIND ROCK AND OPERATED FROM ABOVE
HOW BATTLE WITH OCTOPUS IS FILMED
CAMERA STOPPED TO PERMIT PLACING OF RUBBER ARM AROUND HIS NECK

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AIR HOSE IS SUPPOSED TO BE CUT:— REALLY IT IS CONCEALED BY WATER AND GOES BACK TO PUMP ON BEACH

In the octopus scene a "shot" of a real live octopus in a tank was taken. From this scene the scene was cut to the under water shot, where the diver battles with an octopus. This time, however, the octopus was artificial and was constructed of rubber. It was operated from the ship above. The inky cloud effect was produced by pressing a bulb that forced the liquid lamp black preparation through openings in the body of the octopus. While the rubber arm was being placed around the diver's neck, the camera was stopped. Photo above shows Keaton rescuing his lady-fair by coming up from the sea.

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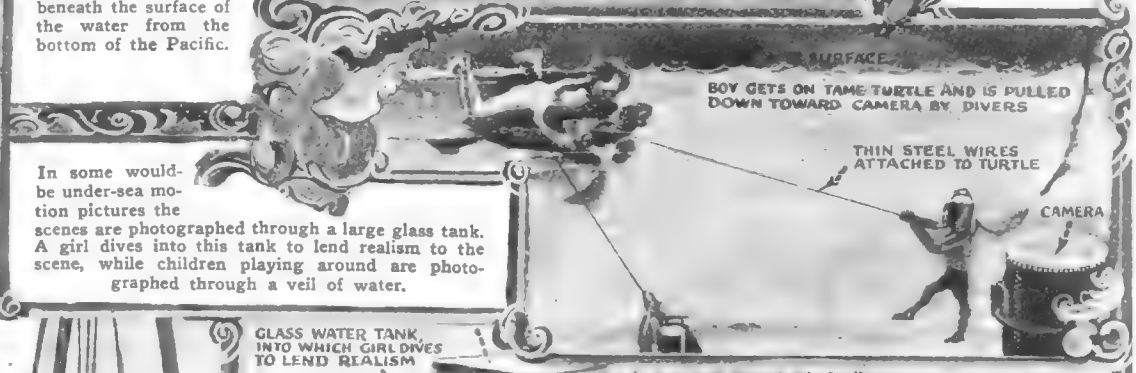
Photography

SCHALLERT

NOT all pictures are taken under water, but the most spectacular motion picture productions are taken on the actual settings as found in nature. A place is usually selected where the foliage is plentiful, where sea ferns and coral abound. Often the motion-picture camera is lowered into the chamber which is to receive it and ground for hours, until the fish become accustomed to the noise and do not start away when the cameraman commences his grind. In "Water Babies", the undersea views were taken eleven miles off the coast of Florida in still water around coral reefs. Masses of coral may be seen in the photographs. The apparatus, by the aid of which the scenes were photographed, was fastened to the bottom with long steel clamps and the cameramen had to dive down and make their entrance through the open bottom of the tank before they could start work. The air pressure was sufficiently high so that the water would not rise more than half way to the top of the camera compartment, and fresh air was constantly supplied by air pumps. The tropical warmth of the ocean in this locality permitted the operators to remain under water for several hours at a time, and the boy, a stunt swimmer, could stay under water for about eighty seconds.

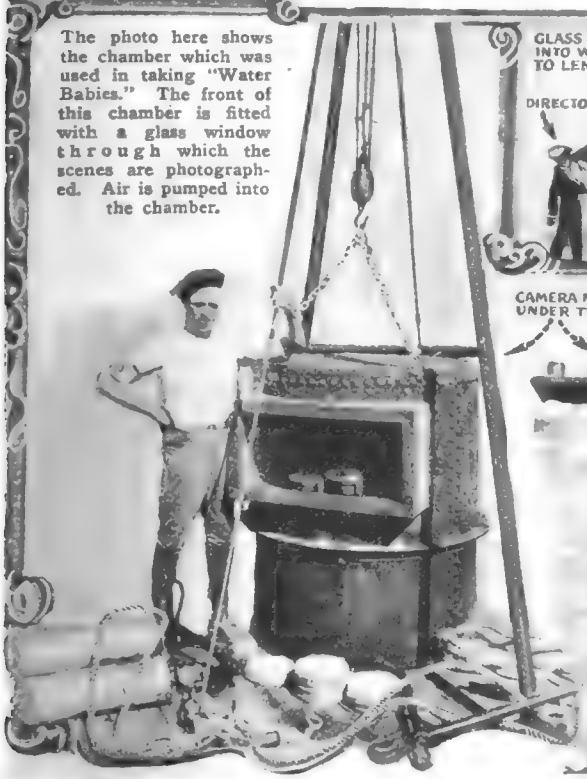
The boy stunt swimmer could by the proper manipulation of weights act as though he were walking around on the ground. He is shown above going through a veritable forest of sea weeds, and in the photo at the left we have further proof that the boy stunt swimmer is actually acting beneath the surface of the water, where the two divers are assisting him across rocky bottoms.

The photo at the left shows the boy stunt swimmer riding the back of a tame turtle. This turtle was controlled by two divers who held thin steel cables which were attached to the turtle. When it was desired to make the turtle submerge, the cables were pulled upon and the camera photographed the turtle swimming beneath the surface of the water from the bottom of the Pacific.



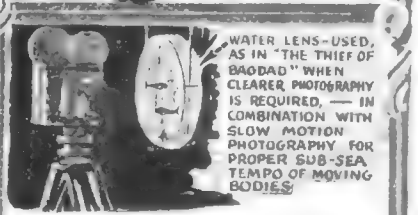
In some would-be under-sea motion pictures the scenes are photographed through a large glass tank. A girl dives into this tank to lend realism to the scene, while children playing around are photographed through a veil of water.

The photo here shows the chamber which was used in taking "Water Babies." The front of this chamber is fitted with a glass window through which the scenes are photographed. Air is pumped into the chamber.



GLASS WATER TANK, INTO WHICH GIRL DIVES TO LEND REALISM
DIRECTOR
CAMERA
CAMERA PICKS UP CHILDREN PLAYING IN SEAWEED THROUGH VEIL OF REAL WATER IN TANK
FAN TO CAUSE SEAWEED TO BLOW,—IMITATING MOTION OF WATER CURRENTS

CAMERA MAN DIVES UNDER THE SHELL
FRESH AIR FROM PUMP
CHARLES GOULD, BOY STUNT SWIMMER, COULD STAY UNDER EIGHTY SECONDS: BY MANIPULATING WEIGHTS HE COULD LIE DOWN AND PRETEND TO SLEEP
20 FT.
AIR PRESSURE KEEPS WATER FROM RISING MORE THAN HALF-WAY


WATER LENS—USED, AS IN "THE THIEF OF BAGDAD" WHEN CLEARER PHOTOGRAPHY IS REQUIRED,— IN COMBINATION WITH SLOW MOTION PHOTOGRAPHY FOR PROPER SUB-SEA TEMPO OF MOVING BODIES

Instead of employing a large glass tank into which a girl may dive and taking the photos through the tank, so that scenes placed in back of it may likewise be registered on the film, a much smaller tank is sometimes used. This is suspended immediately in front of the photographic camera and may have seeweed and fish in it. In combination with slow-motion photography, it gives the proper tempo at which bodies move beneath the surface of the sea.

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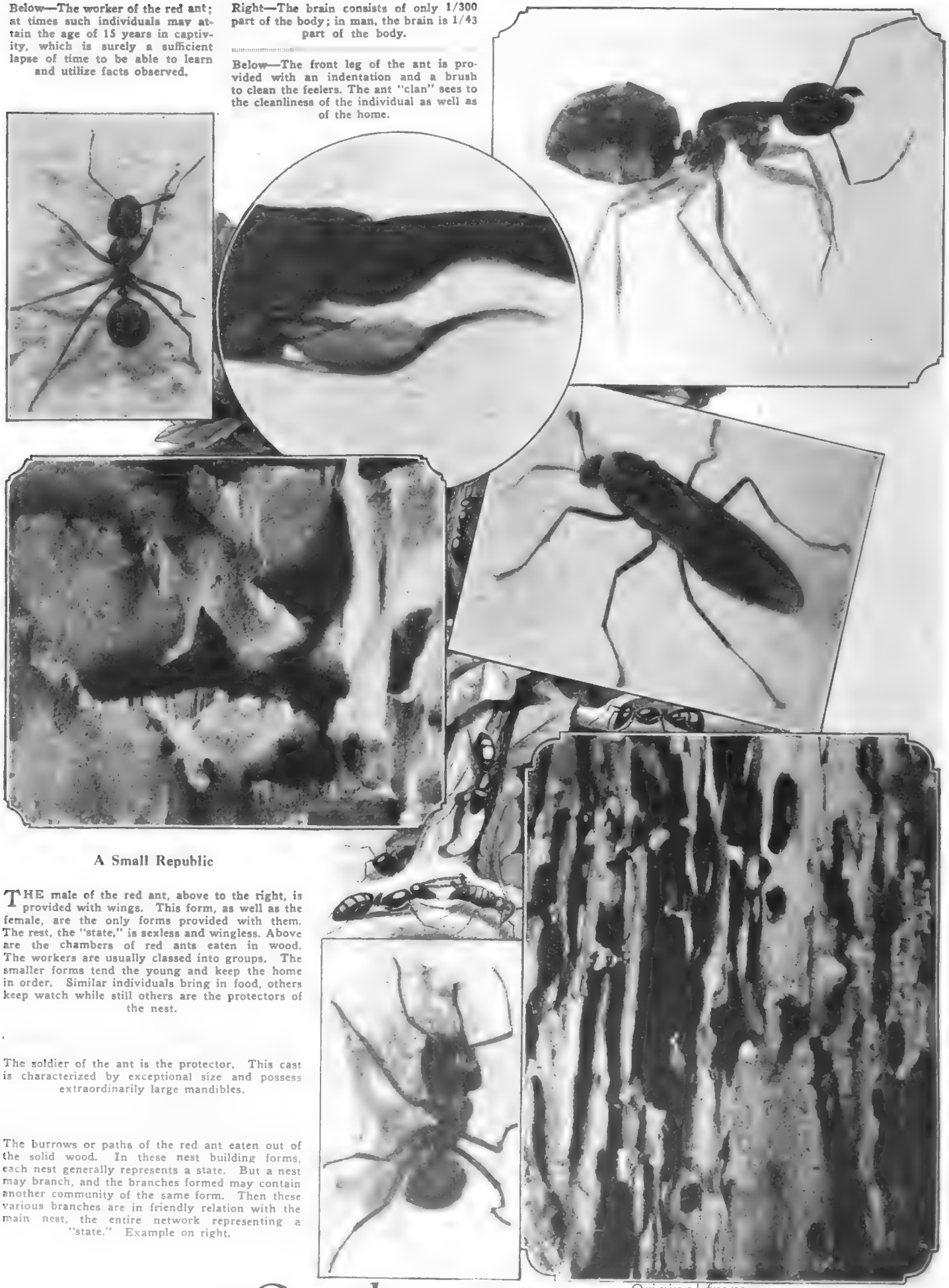
Social Life of the Ant

By DR. ERNEST BADE

Below—The worker of the red ant; at times such individuals may attain the age of 15 years in captivity, which is surely a sufficient lapse of time to be able to learn and utilize facts observed.

Right—The brain consists of only 1/300 part of the body; in man, the brain is 1/43 part of the body.

Below—The front leg of the ant is provided with an indentation and a brush to clean the feelers. The ant "clan" sees to the cleanliness of the individual as well as of the home.



A Small Republic

THE male of the red ant, above to the right, is provided with wings. This form, as well as the female, are the only forms provided with them. The rest, the "state," is sexless and wingless. Above are the chambers of red ants eaten in wood. The workers are usually classed into groups. The smaller forms tend the young and keep the home in order. Similar individuals bring in food, others keep watch while still others are the protectors of the nest.

The soldier of the ant is the protector. This cast is characterized by exceptional size and possess extraordinarily large mandibles.

The burrows or paths of the red ant eaten out of the solid wood. In these nest building forms, each nest generally represents a state. But a nest may branch, and the branches formed may contain another community of the same form. Then these various branches are in friendly relation with the main nest, the entire network representing a "state." Example on right.

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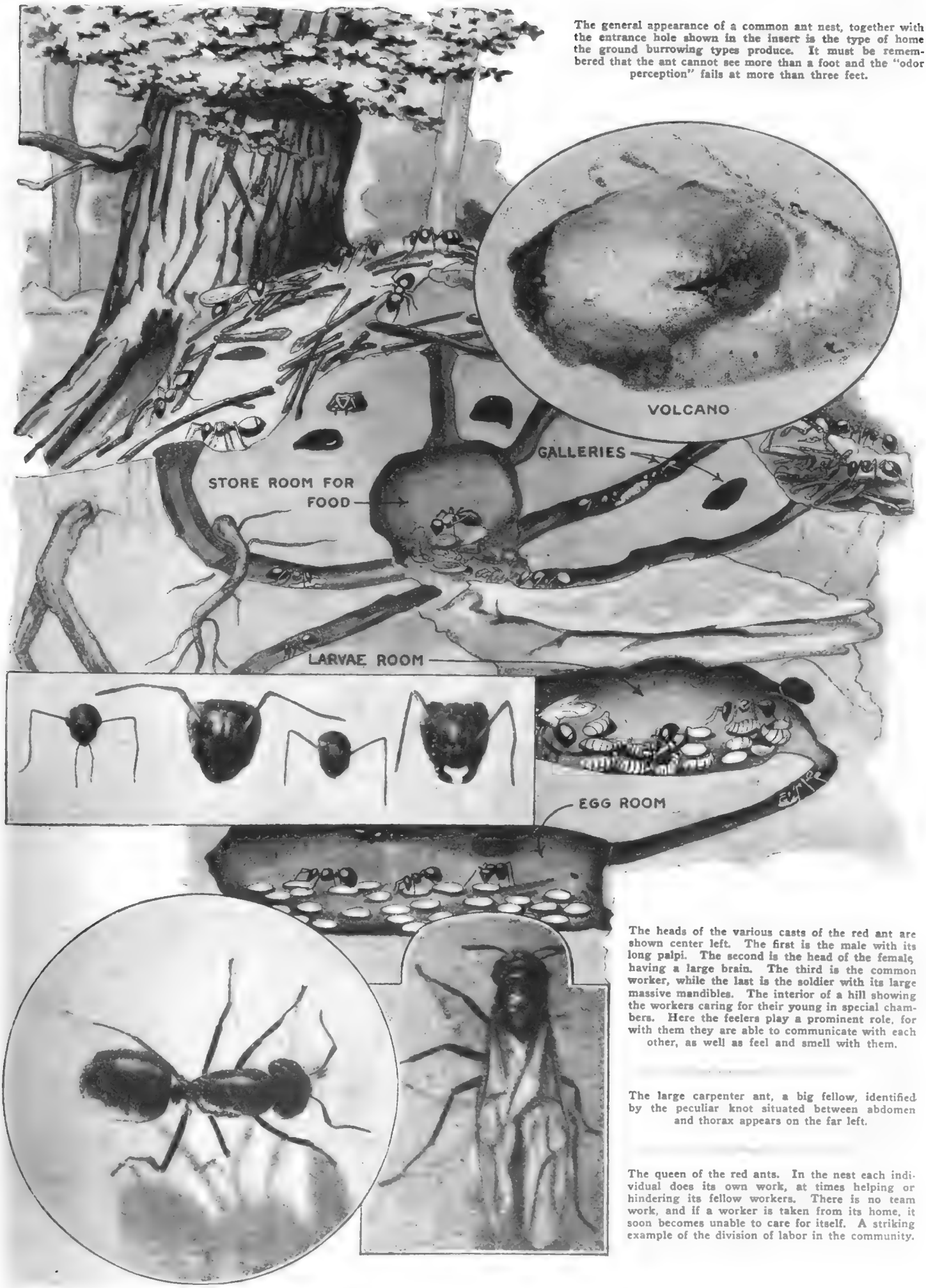

The general appearance of a common ant nest, together with the entrance hole shown in the insert is the type of home the ground burrowing types produce. It must be remembered that the ant cannot see more than a foot and the "odor perception" fails at more than three feet.

The heads of the various casts of the red ant are shown center left. The first is the male with its long palpi. The second is the head of the female, having a large brain. The third is the common worker, while the last is the soldier with its large massive mandibles. The interior of a hill showing the workers caring for their young in special chambers. Here the feelers play a prominent role, for with them they are able to communicate with each other, as well as feel and smell with them.

The large carpenter ant, a big fellow, identified by the peculiar knot situated between abdomen and thorax appears on the far left.

The queen of the red ants. In the nest each individual does its own work, at times helping or hindering its fellow workers. There is no team work, and if a worker is taken from its home, it soon becomes unable to care for itself. A striking example of the division of labor in the community.

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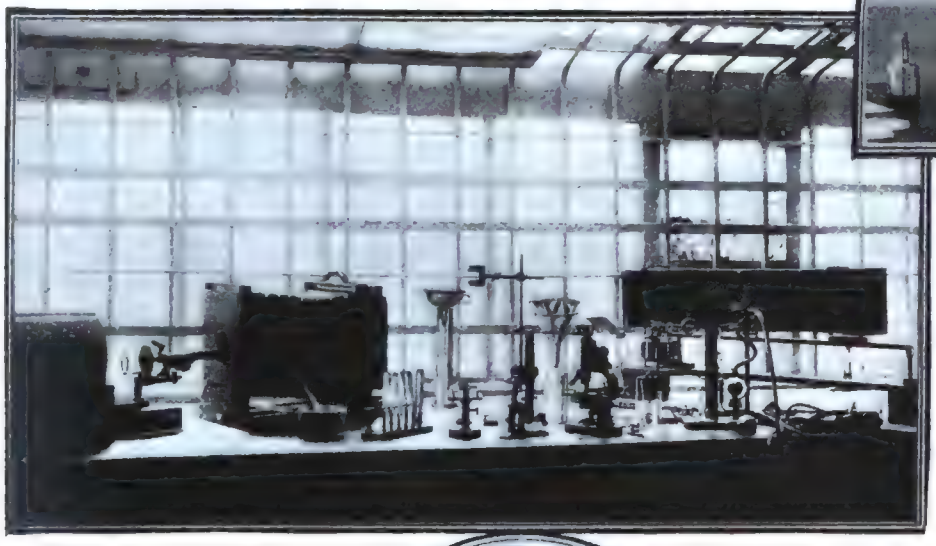
Find the Hair--Find the Criminal!

By MEL WHARTON



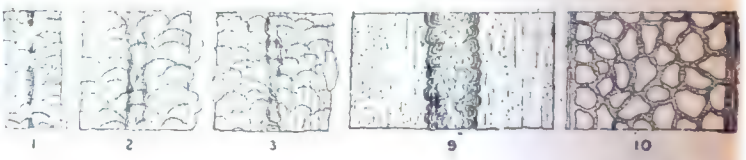
HAIR is the latest source of information to the modern scientific detectives. The Berkeley and Los Angeles Police Departments—the most scientific in the country—following the original investigations of Dr. Schneider, have investigated and annotated a large number of facts concerning the peculiarities of hair. From a little sliver of hair, half an inch long, the enterprising sleuths of the Los Angeles school can tell the nationality, the age, general condition of health, the comparative cleanliness or dirtiness, sex, color and weight of the individual from whom the hair originated. It is also possible to tell whether the hair is straight or curly, and whether the owner is a victim to the use of pomades or curling iron, and whether the hair itself was torn from the head or fell out. The extreme value of such information to the police is of course obvious.

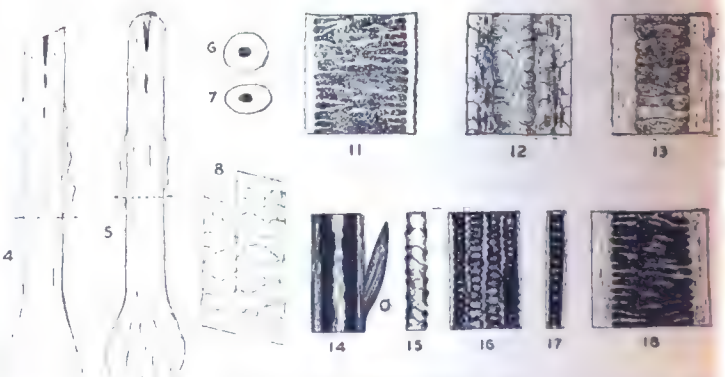
In the sketches immediately below the magnification is about 500 diameters. Fig. 1. A tiny bit of human head hair showing an interrupted pith and numerous pigment granules. Fig. 2. Bit of armpit hair showing the abundant deposits of sebaceous matter. Fig. 3. Bit of pubic hair showing two extruded epithelial cells. Fig. 4. Basal portion of human head hair pulled out by force as indicated by the transversely torn follicle. Sebaceous deposit just above the skin surface line. The upper end has been recently cut by sharp shears. Fig. 5. The shrunken follicle indicates that the hair fell out. Sebaceous deposit much reduced. Fig. 6. Transverse section of a straight head hair. Outline circular with centric pitch. Fig. 7. Transverse section of a curly head hair. Outline elliptical with eccentric pith. Fig. 8. Bit of beard shaving, two days' growth, cut by means of a dull safety razor. Fig. 9. Bit of body hair of Cinnamon bear. Fig. 10. Bit of deer hair showing the very characteristic cellular pith. The cortex is reduced to a minimum, being scarcely noticeable. Fig. 11. Hair of Alaskan ermine. Fig. 12. Hair of Rhesus monkey. This hair shows the general characteristics of human body hair. Fig. 13. Body hair of dog. Compare with hair of the coyote. Fig. 14. Bristle or hair of black caterpillar showing one prong or branch. Fig. 15. Bit of wool (sheep). There is no pith or medulla and there are no pigment granules. Fig. 16. Body hair of rabbit. Fig. 17. Body hair of Scotch mole. Fig. 18. Body hair of coyote. Resembles very closely the hair of the dog, somewhat coarser.

The photograph at the top of the page shows the interior of the laboratory of the Los Angeles Police Department where the hair observations and analyses are made.

The various heads shown here illustrate clearly the difference between the hair characteristics of different races and sub-races, which is the first broad analysis made.

The analysis not only tells race, but it also demonstrates the particular part of the body or head at which the hair originated, and whether the hair has been trimmed recently or not.





Detail of the drawings shown above are given at the bottom of the large caption. These comparative studies give a clear idea of the origin of the knowledge used by the department.

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Science in Pictures

The News of the Month Briefly Reviewed

The versatile moving stage illustrated below has been designed by the sculptor Kiesler and is in use in Vienna. It can be moved up and down and revolved as desired. Right: Robert V. Jaros of the University of Chicago with a model airplane constructed by him that stayed in the air for ten minutes, fourteen and two-tenths seconds, establishing a world's record.

Right: A novel aerial advertisement which for some time floated in the air 300 feet above Columbus Circle, New York City. It represents a well known make of balloon tire and in itself is 24 feet across. Made of very light balloon fabric, it contains 3000 cubic feet of hydrogen and is held in place by means of flexible steel cables. From the street, the cables were hardly visible and the tire appears to be suspended in the air without any support whatsoever. Needless to say, the advertisement created a considerable amount of interest.

Above: Ornamental lamp posts made by Ray Lambert, Park Commissioner, San Antonio, Texas. Mr. Lambert uses discarded tin cans as the core of the lamp posts, covering these forms with concrete. Thus, ugly refuse is turned into a useful channel.

The above photograph by E. L. Braley is interesting in the extreme. It is seldom that one sees a photograph combining such a wonderful reflection with that atmospheric phenomenon known as "the sun drawing water."

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The LIVING DEATH

By JOHN MARTIN LEAHY

Frontenac stood at the entrance to the freezing-room and, as a dog was brought forward, he made an injection in the animal's neck.

SYNOPSIS

Captain Livingstone, an Antarctic explorer, calls into conference a famous scientist, Darwin Frontenac, who has distinguished himself in research work involving methods of inducing hibernation in mammals. In the presence of Mr. McQuestion, a reporter, Captain Livingstone recounts a weird tale of exploration and discoveries in the Antarctic. He tells how, with a well equipped ship and a hearty crew, he started for the South Pole and how, far south of the Antarctic circle, land was discovered. Leaving part of the crew at this point and travelling overland, the explorers found the air to become warmer and to their great astonishment they discovered a land, surrounded by high mountains, the temperature of the region being far above the freezing point and where palm trees and luxurious flowers flourished. During part of their exploration trip, a "Thing" unknown to them killed all of the explorers with the exception of Captain Livingstone and a man by the name of Hampden. Leaving this Garden of Paradise, as this spot had been named at first, the two men travelled onward. Some distance further on they discovered a cave, the floor of which was covered with a thick coating of ice and encased in that ice they found the body of a beautiful young woman, clothed as only inhabitants of a tropical country would be. The Captain formed the opinion that this girl was not dead, but was in a state of suspended animation—in other words, neither living nor dead.

It was with this girl in his mind that the Captain approached Darwin Frontenac. His object was to induce the scientist to exercise his knowledge toward bringing this beautiful young girl back to life. After the facts stated above had been recounted to Frontenac and Mr. McQuestion, they agreed to go to the Antarctic regions and attempt to revive the girl if, to quote Frontenac . . . "—that 'Thing' in the Garden of Paradise doesn't get us within the reach of its claws."

FIFTH INSTALLMENT

CHAPTER XV

ANOTHER MONSTER—THE DOOR

CAPTAIN STANLEY LIVINGSTONE came to his feet and reached out his hand; Frontenac too arose and extended his own; and the captain pumphandled away at him in fine fashion.

"I knew, Mr. Frontenac, that you would do it!" he exclaimed, the puffed and livid features working with strong emotion. "I knew that you would awake my Sleeping Beauty!"

As for myself, my astonishment was very great. This was not like Darwin Frontenac. I had thought that he would give this matter—one of the strangest and wildest things, certainly, that had ever been presented to any man—long and careful attention. And now look! Frontenac had already answered—answered before the explorer had even finished his story!

"And you, Mr. McQuestion?" the captain said. "Are you going to go, too?"

"Really the thing is so unexpected, so strange. I must have time to think it over—that is, if Darwin wants an Icicle Mucky-muck like me along."

"You know nothing would please me more, old *tillicum!*"

"Well, I must think it over."

"Of course," the captain nodded. "Of course."

The two resumed their seats.

"I found her," said the captain, "but I am a doomed man; I shall never see her again."

A strange look came over his visage. His lineaments moved in a wan, melancholy smile.

"I am getting up in years, and, if the truth must be told, I am, after all, something of a hardened old sinner, and yet——"

That smile slowly left his face, and for a time he was silent—a strange, rugged pitiable figure.

"And yet, gentlemen, sometimes I think that—yes, I sometimes think that I love that girl."

Darwin Frontenac's look was suddenly keen and questioning, then as suddenly was what it had been a moment before.

The figure, cut out of the living rock, was a colossal one, being thirty feet in height and fully fifty in width. It was perched upon a heap of (sculptured) human skulls, the wings were outspread as though it was about to launch itself down upon us.

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"Yes, it is so," said the captain, burying his face in his hands. "I could never forget her. Call me an old fool—call me what you will! She was so sweet, so lovely there in her bed of crystal—a sight so sad that I wept to see her lying there. But I shall never see her again. My aneurism may burst at any moment."

Darwin Frontenac glanced in my direction. I saw in his eyes only wonder and awe.

The captain raised his head from his hands. That wan, sad smile—a thing I could never describe—passed over his features once more.

"An old fool's weakness, gentlemen," he said, giving a melancholy wave of his hand. "I don't know why I have told you this. Heaven knows, I never intended to tell it to any man. But what, after all, does it matter? I shall never see her again. But you will see her, Mr. Frontenac, and you, too, I fancy, Mr. McQuestion. Yes you will see her there in her tomb of ice—perhaps on a day see her smiles and hear her laughter. Perhaps you—both of you—will love her too.

"Poor little kid! as Hampden said. You will be good to her, Mr. Frontenac, I know. Yes, she will never regret that you awoke her, or you regret it, either. In a way, she will be your daughter, unless, that is—a thing which I think not unlikely—she becomes one even dearer still."

It was Frontenac now who smiled. He made no response, however.

"But," said the captain, "who can say what will be? All that is in the future.

"As for the expedition, today would have found us almost ready to put to sea—perhaps, indeed, actually under way—if it hadn't been for this hellish aneurism of mine. I had known for some time that there was something wrong. I thought, though, 'twas nothing serious and that it would pass away, as so many other things had done. But it did not pass away. It got worse instead of better. And so finally I went to a doctor. I demanded the truth; he gave it to me. I went to another and yet another; it was the same thing. It was quite a shock at first, gentlemen. For a time I tell you I felt mighty bad. But I brought my philosophy, such as it is, to bear upon the matter, and I soon resigned myself to my fate.

"But what to do about the expedition? Things were rapidly nearing completion. Nunatak—maybe you have heard of Nunatak in Alaska, Mr. McQuestion? His real name is an odd one truly—Louis Louisiana."

A few moments, and we had cleared the pier and were out in the stream.

"Oh, yes."

"A fine man," said the captain. "They say that he is one of the best, perhaps the very best musher in all the Northland. He is as tall as a bean-pole, skinny as a poker, and one eye is black and the other is blue. Ever meet him up there?"

"No. I've seen many a man up North with one eye or both eyes black *and* blue, but I never saw a man, there or any other place, with one eye blue and the other black. I remember hearing of this Nunatak, though."

I turned to Frontenac.

"Ever hear of a man with peepers like those before?"

"Oh, yes. Never saw such an one, though."

"As I was going to say," the explorer went on, "there was everything almost ready and Nunatak on his way down from the North with the dogs—genuine Eskimo dogs, from the Tinnanannomook country—and now, like a bolt from out the blue, came this sentence of death!

"What was to be done? Should the *Multnomah* sail anyway—the expedition to go on under the second in command when the aneurism finished me? I didn't know what to do. And, while I was trying to decide, I read of your discovery, Mr. Frontenac, and I made up my mind to come to you and tell you what I had never told any man—the whole of my story. Thank God, I did come! I shudder to think, though, how near I was to backing out, for I was afraid you might regard it all as nothing but a fairy tale.

"I suppose, however, that the *Multnomah* will be ready to cast off by the time that you can get your affairs in shape. When I decided to come to you and tell you my story, the first thing I did (on the chance that you might believe me) was to draw up papers that would forestall any hitch or difficulty in case I should be bumped off before the expedition got away. There is no telling; I may live for months, and, again, I may go at any moment. However, I have fixed matters so that, if I die this minute, things can go on as smoothly as though nothing had happened.

"Your discovery, Mr. Frontenac, will make at least one change necessary: you will, I suppose, want a freezer on the *Multnomah?*"

"By all means."

"I didn't think that you would awake her down there."

"Of course not."

"That's what I thought. So there will have to be a freezing-room to bring her back in."

"Just so. And there are the dogs," Frontenac reminded him. "How many?"

"About one hundred."

"The freezer must be large enough to hold all those dogs, with some additional space. For we will *kill* them, pile them up in the freezer and thaw them out when we reach Summer Haven. That will be much better than having them crowded about the decks, to say nothing of the saving in food."

"By Joe!" the other exclaimed. "I never once thought of that."

"However," Frontenac said, "these details can be taken up later. I am anxious, Cap-

(*Continued on page* 1048)

There was a cry, and I looked up and saw Hampden make a wild effort to turn and save himself, the rear end of the sled tip up, and the sled slip forward and vanish, dragging the dogs down after it.

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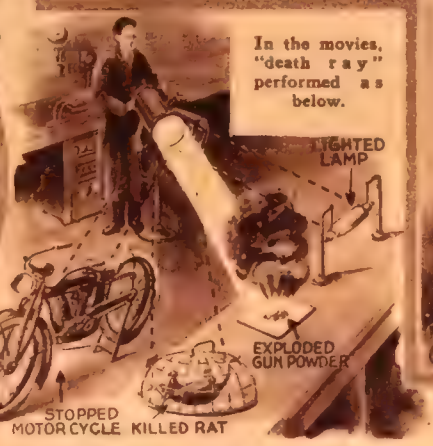
"Death Ray" in Movies

They Do It In the Movies!!

The inventor of the "death ray" recently staged a movie on that subject for Pathé.

Left: An action scene from the "death ray" movie.



In the movies, "death ray" performed as below.

Above: One of the elaborate property settings used in the filming of the Grindell Matthews' "death ray" movie.

Harmless X-Ray

The medical world has recently been startled by a statement to the effect that in France there is in use a device which gives the effect of an X-ray, yet employs none of those emanations that have been known by that title since their discovery by Roentgen. The device which gives this effect is illustrated at the left. It consists of a series of 30,000-watt lamps, half silvered, as shown, mounted on a rotating wheel and lighted at the instant that they pass a given point. At this point, the rays of the lamp are directed through a lens so that they give the effect shown. Each bulb is used for such a short space of time that, it is claimed, little, if any, heat reaches the patient. The light is, therefore, called cold and in the upper lefthand corner of our illustration is shown a comparison between a photo taken with ordinary X-rays and "cold light." The blood vessels and organs can be seen.

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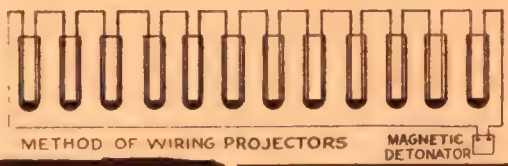
Poison Gas Shells

By LIEUT. ROBERT E. SADTLER, Chemical Warfare School, U. S. Army

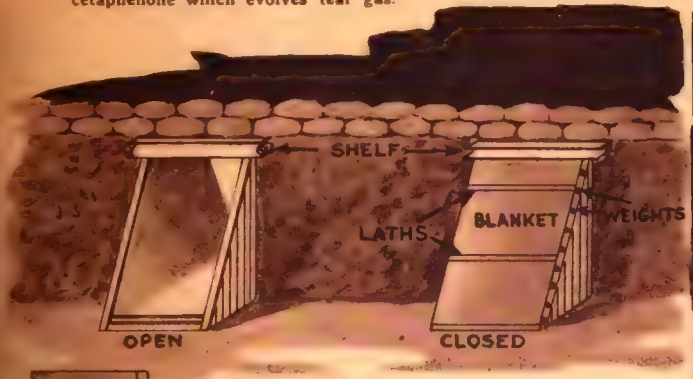
ENEMY TRENCHES
OLD METHOD OF MOUNTING PROJECTOR
DETONATOR
LIQUEFIED GAS PARTICLES CHANGE TO GAS BY EVAPORATION
INCENDIARY SHELL CAUSES PERSISTENT FIRE ALMOST UNQUENCHABLE

The various gases and solids as well as incendiary materials have been studied and experimented with by the United States and other world powers to such an extent that they are very effective. These gases and solids have been incorporated in shells so that they can be made deadly, even at long distances from the trenches of the users. The illustration directly above shows one method of mounting the projectors of these shells known as the 8-inch Livens type, after the inventor. They are mounted so that the mouth projects at an angle of 45 degrees.

The three most important gaseous chemical agents used in chemical warfare are mustard, phosgene, and chlorpicrin gases. Also there are three important solid materials used. They are diphenylchlorarsine used as a toxic smoke, diphenylaminechlorarsine for the same purpose and chloracetaphenone which evolves tear gas.

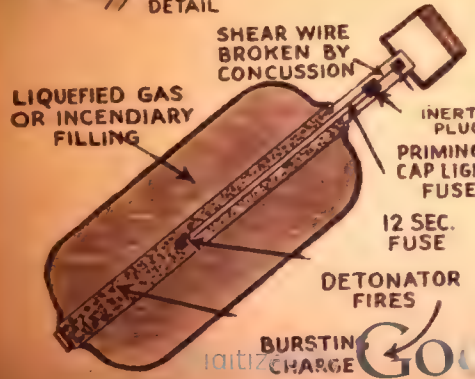


An entire battery of Livens projectors are wired together in series as shown at the left and are simultaneously detonated from a single point by means of a magnetic device. The insert above and to the left shows the effect of bursting gas and incendiary shells.



SHELF DETAIL

TYPICAL ARRANGEMENT FOR GAS-PROOFING DUGOUTS

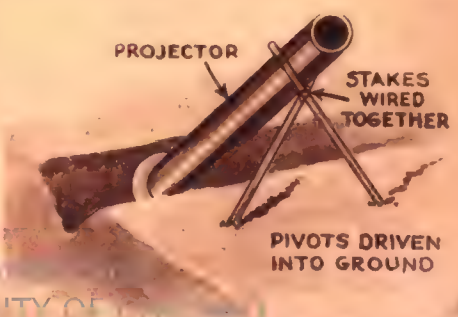


CROSS-SECTION OF PROJECTILE

The illustration in the lower righthand corner shows an improved American method of mounting Livens projectors that is equally as effective as the old type, and can be placed in one-fifth the usual time.

Above and to the right are illustrations of various types of gas masks used in the World War. Note the variations in size and form.

At the left is shown one of the improved types of Livens gas shells as used in the projectors illustrated herewith. Note the simple, yet effective method of breaking the shell. Directly above the shell is shown a typical arrangement for gas-proofing dugouts. A blanket with laths nailed to it at intervals serves as an effective block to the gas when the edges are weighted down.



AN AMERICAN METHOD OF EMPLACEMENT

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Everyday Chemistry

By RAYMOND B. WAILES

WHY DO SO MANY MEDICINES CONTAIN ALCOHOL?

1

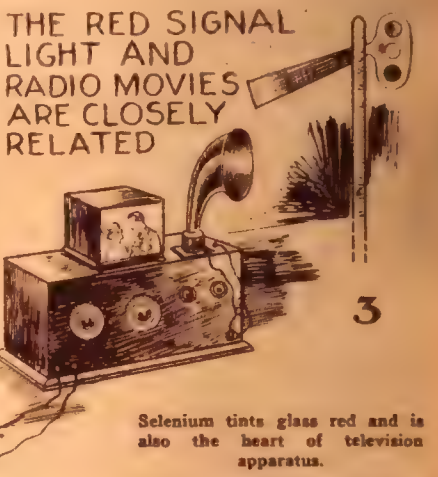
To dissolve some of the ingredients not soluble in water, not as a stimulant.

IS THE RING AROUND THE TUB DIRT?

2

No, not entirely. It is mainly a substance formed by soap and minerals.

THE RED SIGNAL LIGHT AND RADIO MOVIES ARE CLOSELY RELATED



3

Selenium tints glass red and is also the heart of television apparatus.

GUN COTTON IS NOW USED IN PRODUCING THE FINISH FOR THE SNAPPY SPORT CARS

4

The glossy finish on high class sport cars is usually due to a paint containing non-explosive gun cotton.

ADD A POISON TO YOUR SALT

5

Iodine in the proportion of .01% in salt prevents goitre and is harmless. Some manufacturers call this "Iodized Salt."

THE RED LIQUID IN THERMOMETERS IS NOT RED MERCURY, IS IT?

6

Metallic mercury is never any color but silvery. The red liquid is alcohol containing a red dye.

IS IT TRUE THAT THE HARDENING OF COPPER HAS BEEN "RE-DISCOVERED"?

7

Hardened copper is considered by metallurgists to be nothing but copper alloys. Aluminum bronze would be a more appropriate name.

WHAT MAKES SOME SOAPS FLOAT?

8

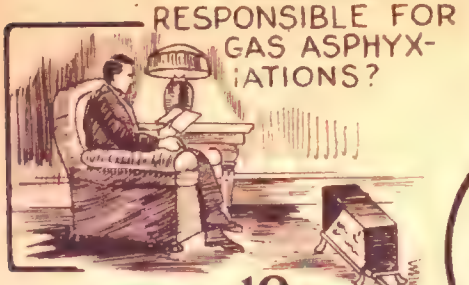
Because of the fact that there are minute air bubbles in the soap, not because of any secret ingredient.

OF COURSE THE RADIATOR GILDING IS NOT GOLD, BUT WHAT IS IT?

9

The gold color is imparted by powdered brass or bronze. This can be proven by a flame test, which will show green.

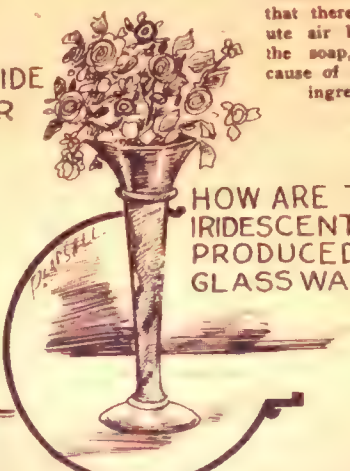
IS CARBON MONOXIDE RESPONSIBLE FOR GAS ASPHYX-IATIONS?



10

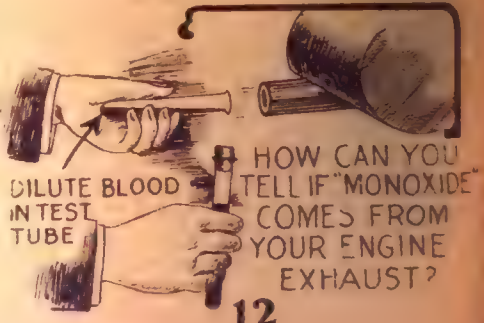
Only partly. Ethylene or "looney gas" plays a part. This gas gives illuminating gas its yellow color.

HOW ARE THE IRIDESCENT COLORS PRODUCED ON GLASS WARE?



11

By allowing the vapors of metal chlorides to play about the glass while it is heated.



12

Diluted blood will turn pink when exposed to carbon gas, if carbon monoxide is present.

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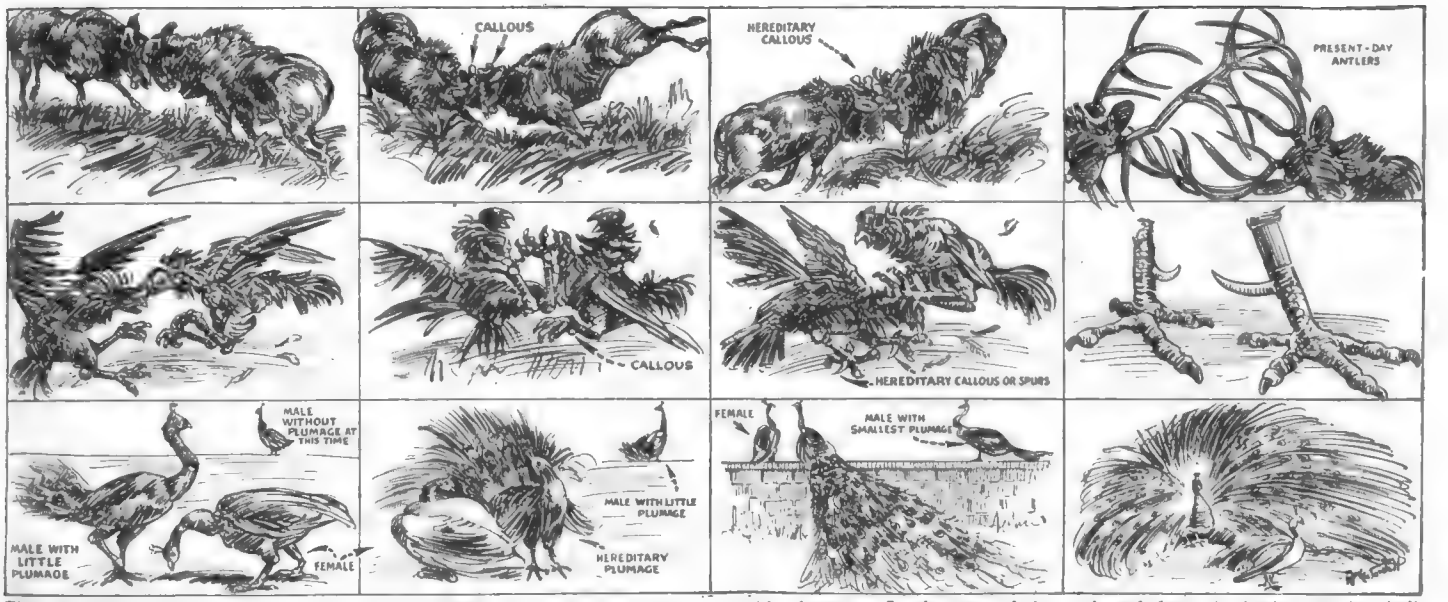
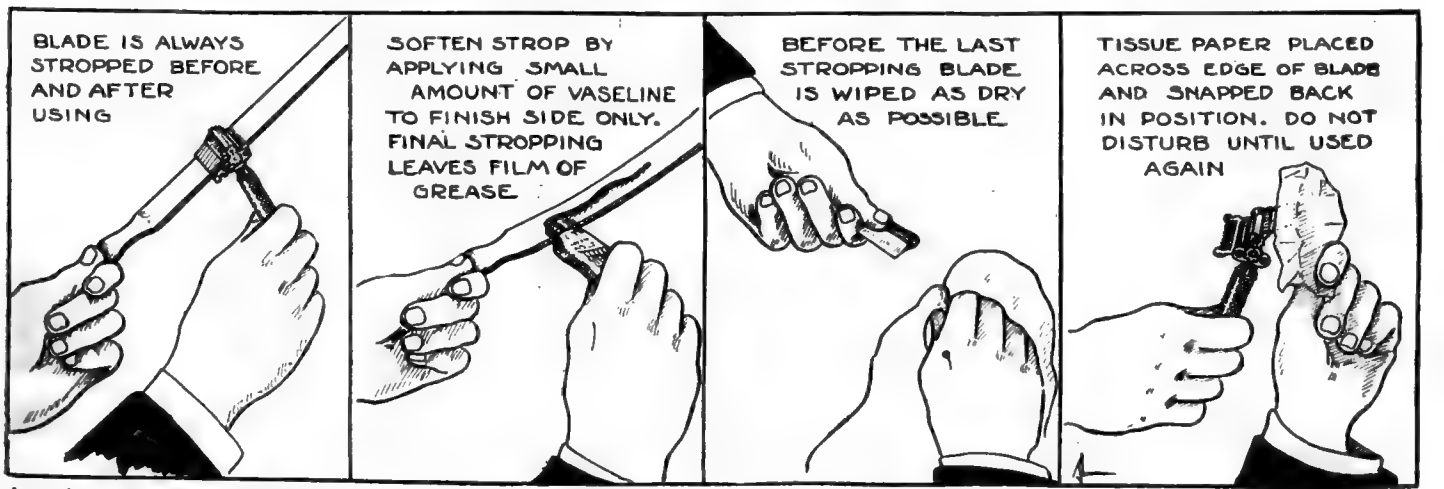
Glands Assist Evolution



That the endocrinal system which governs the growth of mammalian bodies will automatically adjust itself and the body to any set of circumstances over a number of generations, is clearly illustrated according to Dr. T. J. Cunningham in the case of the deer's antlers, the cock's spurs and the peacock's plumage. In the case of the cock and deer, the bruises at the skull and feet cause certain impurities to be fed back into the blood, which cause the glands to construct a natural projection. In the case of the plumage of the peacock, it is a matter of natural selection.

Safety Razor Blade Gives 400 Shaves

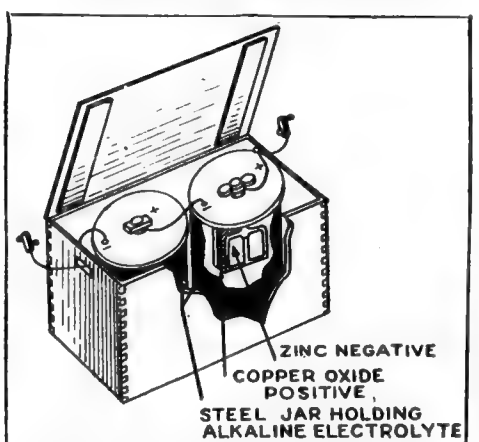

BLADE IS ALWAYS STROPPED BEFORE AND AFTER USING
SOFTEN STROP BY APPLYING SMALL AMOUNT OF VASELINE TO FINISH SIDE ONLY. FINAL STROPPING LEAVES FILM OF GREASE
BEFORE THE LAST STROPPING BLADE IS WIPED AS DRY AS POSSIBLE
TISSUE PAPER PLACED ACROSS EDGE OF BLADE AND SNAPPED BACK IN POSITION. DO NOT DISTURB UNTIL USED AGAIN

A year's shaves from one safety razor blade may be obtained if the blade is stropped both before and after shaving, and the blade kept covered with a piece of tissue paper while not in use. The sketches above show clearly the necessary steps in the technique.—O. H. Knoon.

Strongest Lock

The strength of laminated construction is used to advantage in this latest design of padlock shown above. The body is constructed of laminated cold rolled steel sections and will withstand much more pressure before releasing than the ordinary type of padlock. Only one key works it.

Radio Battery



The most recent adaption of the Edison primary cell is for radio work illustrated above. Each cell gives approximately .7 volt.

For Drafting

The instrument shown above, a combination tee square and protractor, will be found exceptionally useful to the draftsman.

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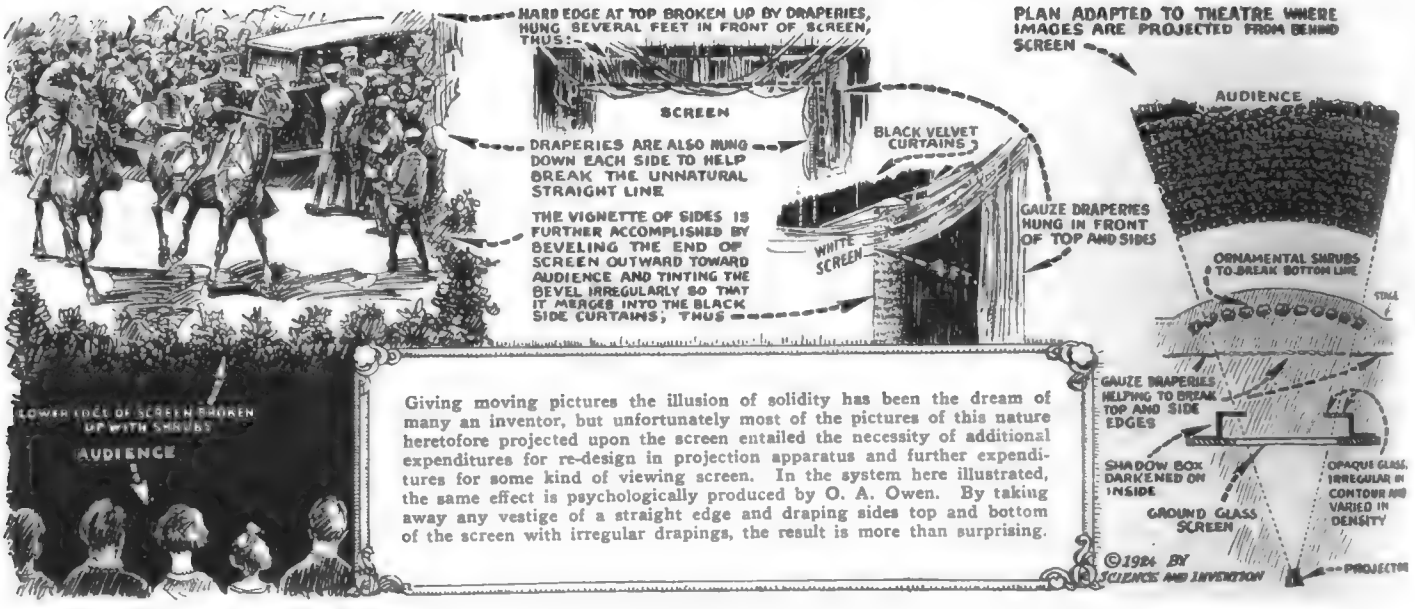
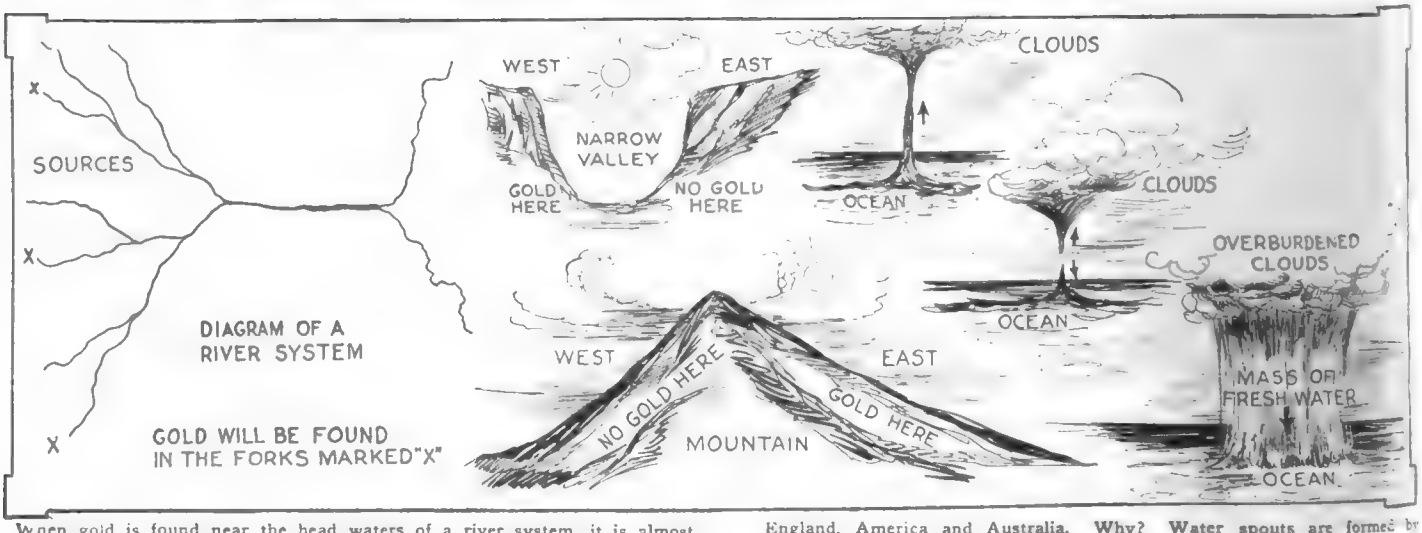
Stereoscopic Movies


HARD EDGE AT TOP BROKEN UP BY DRAPERIES, HUNG SEVERAL FEET IN FRONT OF SCREEN, THUS:-
SCREEN
DRAPERIES ARE ALSO HUNG DOWN EACH SIDE TO HELP BREAK THE UNNATURAL STRAIGHT LINE
THE VIGNETTE OF SIDES IS FURTHER ACCOMPLISHED BY BEVELING THE END OF SCREEN OUTWARD TOWARD AUDIENCE AND TINTING THE BEVEL IRREGULARLY SO THAT IT MERGES INTO THE BLACK SIDE CURTAINS; THUS
BLACK VELVET CURTAINS
WHITE SCREEN
GAUZE DRAPERIES HUNG IN FRONT OF TOP AND SIDES
PLAN ADAPTED TO THEATRE WHERE IMAGES ARE PROJECTED FROM BEHIND SCREEN
AUDIENCE
ORNAMENTAL SHRUBS TO BREAK BOTTOM LINE
STAGE
GAUZE DRAPERIES HELPING TO BREAK TOP AND SIDE EDGES
SHADOW BOX DARKENED ON INSIDE
OPAQUE GLASS, IRREGULAR IN CONTOUR AND VARIED IN DENSITY
GROUND GLASS SCREEN
PROJECTOR
LOWER EDGE OF SCREEN BROKEN UP WITH SHRUBS
AUDIENCE
©1924 BY SCIENCE AND INVENTION

Giving moving pictures the illusion of solidity has been the dream of many an inventor, but unfortunately most of the pictures of this nature heretofore projected upon the screen entailed the necessity of additional expenditures for re-design in projection apparatus and further expenditures for some kind of viewing screen. In the system here illustrated, the same effect is psychologically produced by O. A. Owen. By taking away any vestige of a straight edge and draping sides top and bottom of the screen with irregular drapings, the result is more than surprising.

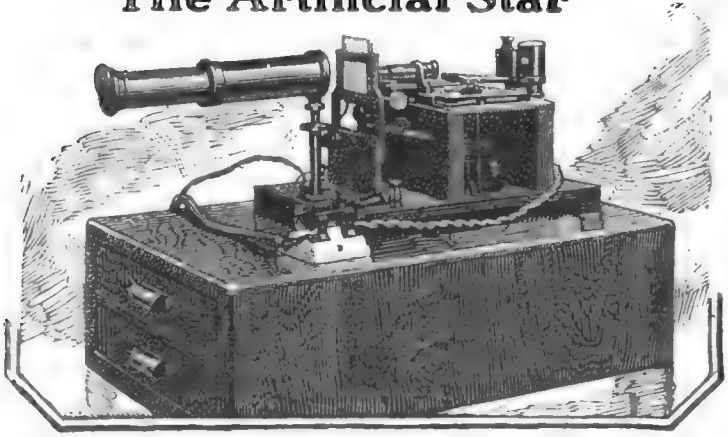
Some Unsolved Riddles of Science



When gold is found near the head waters of a river system, it is almost invariably found in the right hand branch, if the observer stands at the source and looks down stream. Gold miners know that the spots where the sun shines before noon are always richest in this precious metal. This has been found true and verified in such a widely separated countries, as England, America and Australia. Why? Water spouts are formed by centrifugal force. When a water spout occurs on the ocean, salt water is carried upward. Why is there a deluge of fresh water at the moment the spout breaks?

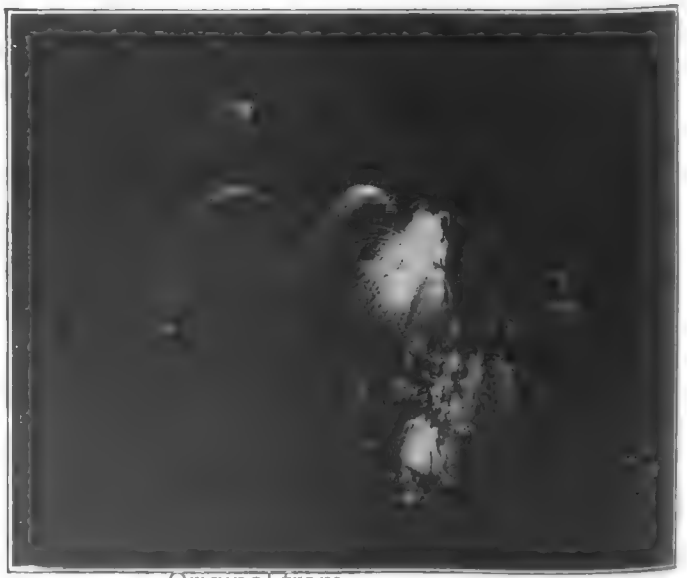
—O. Ivan Lee, B.Sc., F.M.S.A

The Artificial Star'



The instrument above is designed for eliminating the human equation of error in recording the passage of stars. In this machine an artificial star crosses a line, and the length of time required by the astronomer in reacting to the crossing is definitely determined. —Courtesy Elgin Watch Co.

Fireworks Photo



Right: In photographing fireworks it is best to use red-sensitive plates. These must be developed in total darkness. Use a large aperture and open the shutter for the length of time desired to get complete picture.

—J. M. Howard.

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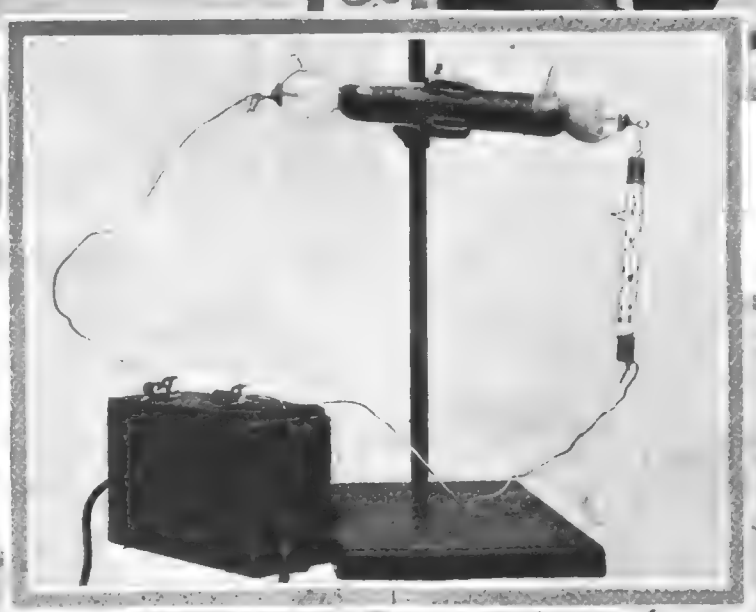
Phosphorescence

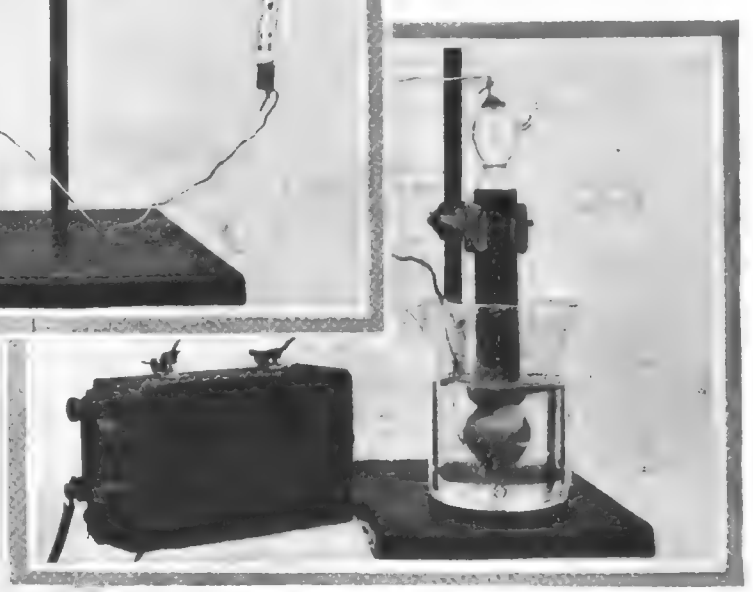
By RAYMOND B. WAILES.

Little chips of fluorspar heated on an iron plate will shine like lightning bugs in a dark room. Paint a sun in a scene with luminous paint. In a dark room hold a lighted cigar or cigarette behind the sun. It will become luminous. Ice will make it disappear in the reverse way.

Coat a card with luminous paint and allow it to dry; then place an object upon it and expose the whole in sunlight. In the dark room the silhouette of the object will appear.

Hot water is lighter and floats upon cold water. A bit of paper coated with luminous paint will show this because the heat will cause the top part to glow. Below: A common medicine, salophen, will glow if rubbed between glass surfaces.





If one end of a Geissler tube is submerged in a solution of quinine to which a drop of storage battery acid has been added, it will glow with a beautiful blue. If a Geissler tube is spirally coated with luminous paint and operated in series with another tube, a fair imitation of a column of fire will be had.

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Specialized Closets

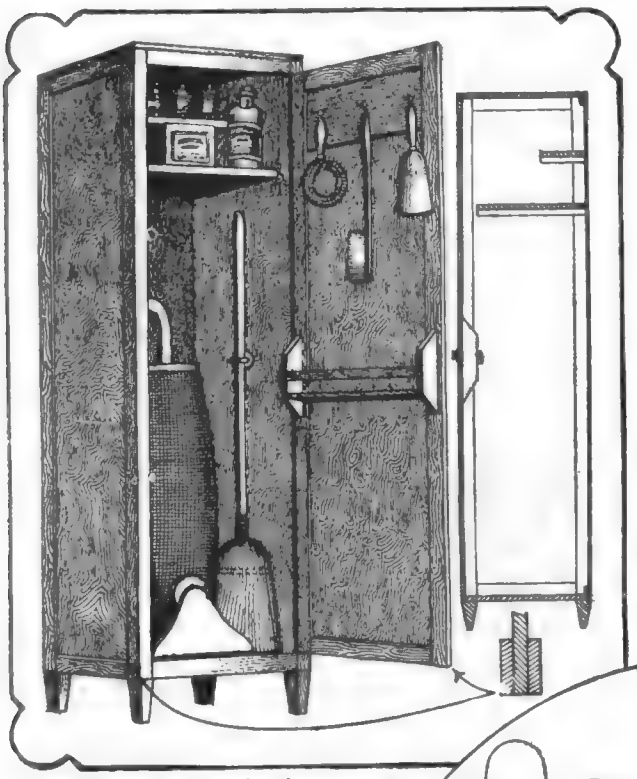
By W. M. BUTTERFIELD

THE first example shown is a closet large enough to hold the entire cleaning outfit of the household—vacuum cleaner, broom, mop, floorwax, furniture polish, etc. The closet has been designed for the kitchen, and is intended to occupy a space on one side of the kitchen cabinet, while another, of the same size and design, is planned for the other side to hold cooking utensils and for tinned food supplies. Panel board can be used in the construction of a closet of this kind for the back, the sides and the door.

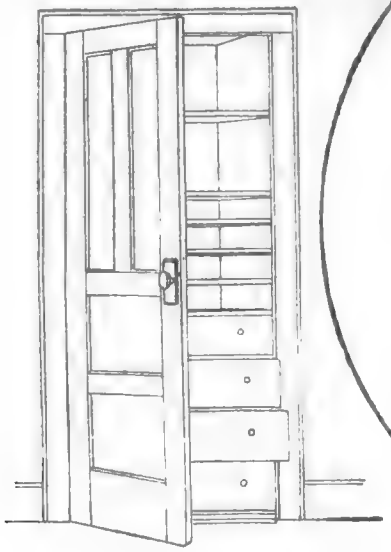
Another example shows a closet for the ironing boards as well as other implements used in ironing. One closet is for the kitchen sink outfit and is designed to occupy a space over the sink.

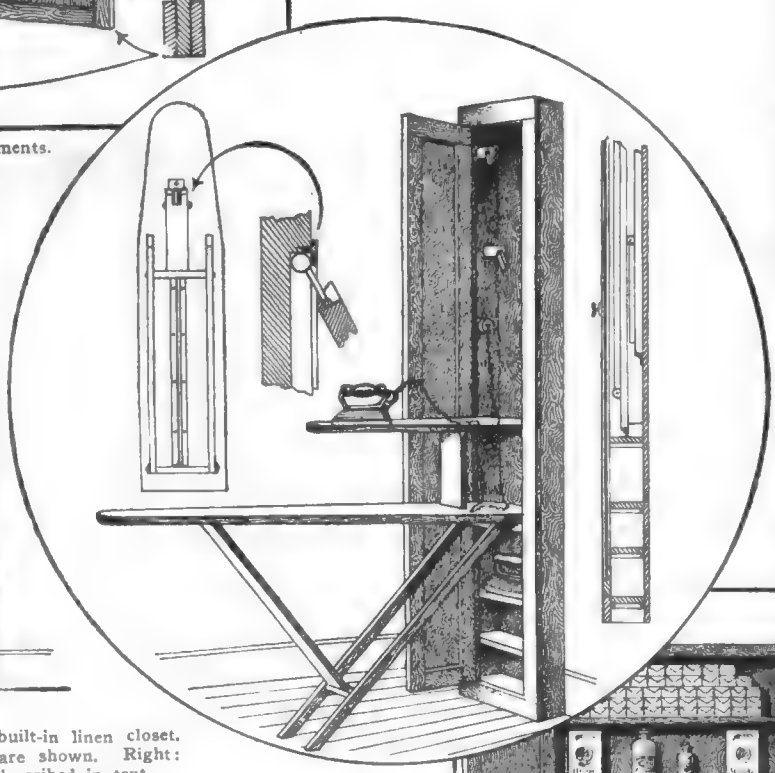
Every housewife wants a linen closet—many are willing to sacrifice one for clothes if they can only have one for linen. Answering this almost universal call of the housewife, we show a plan by which the sacrificed clothes closet can be converted into a bona-fide linen closet. In fact, this closet was designed for a storage place for linen, although it may have the outward appearance of the usual receptacle for clothes. A rather complicated design is shown in which dressing table and closets occupy one whole end of a bedroom. Specialization is shown here, also, for one closet is for outer garments, the other for under garments. There also are drawers for the usual dressing table supplies in the table and a box for shoes under the drawers. A neat bench is provided as part of this outfit. Mirrors are set in through sides above the table while an overhead electric fixture to supply illumination is installed.

In constructing drawers or drawer-like trays, in closets, it is necessary to provide for space for drawpulls and for space at the door side to pull the drawer out past the door. We have shown a series of detailed sketches to illustrate the requirements and one method of procedure. In the ironing board details, we have shown the most practical device for supportng the board yet devised. It consists of two folding members, one hinged to the board, the other fastened to the board by means of a T-shaped metal piece sliding in a long metal-covered groove in the board. This works automatically.

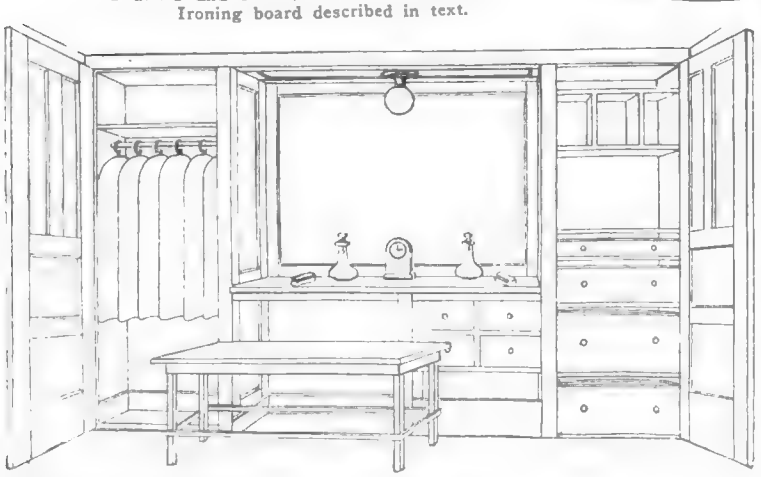


Above: Closet for cleaning implements.

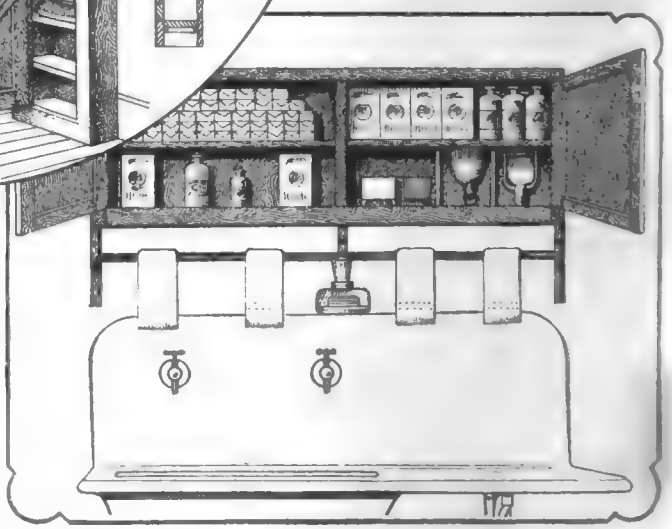


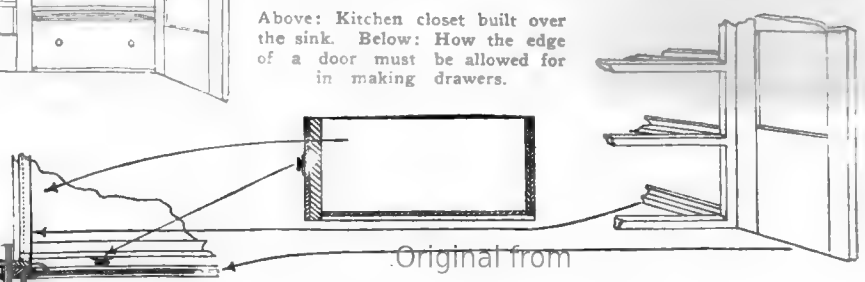


Above: View of a built-in linen closet. Drawers and shelves are shown. Right: Ironing board described in text.



The illustration above shows two built-in closets with a dressing table and drawers placed between them. All should be constructed of the same kind of wood and stained to match. A bench completes the set.





Above: Kitchen closet built over the sink. Below: How the edge of a door must be allowed for in making drawers.

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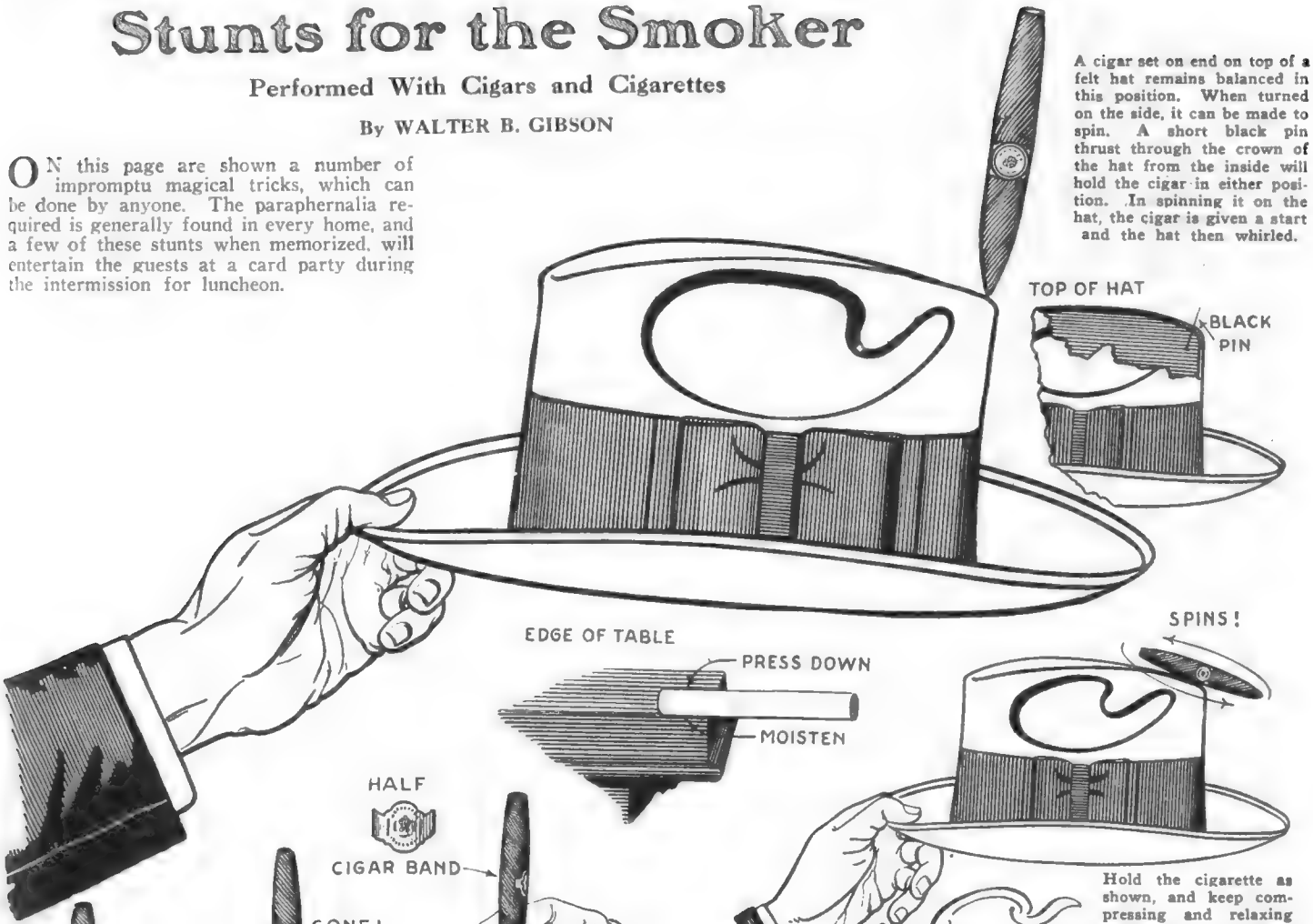
Stunts for the Smoker

Performed With Cigars and Cigarettes

By WALTER B. GIBSON

ON this page are shown a number of impromptu magical tricks, which can be done by anyone. The paraphernalia required is generally found in every home, and a few of these stunts when memorized, will entertain the guests at a card party during the intermission for luncheon.

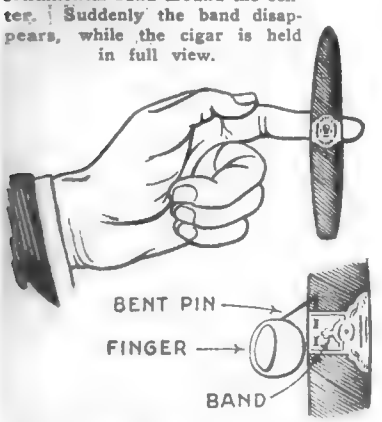


A cigar set on end on top of a felt hat remains balanced in this position. When turned on the side, it can be made to spin. A short black pin thrust through the crown of the hat from the inside will hold the cigar in either position. In spinning it on the hat, the cigar is given a start and the hat then whirled.

Hold the cigarette as shown, and keep compressing and relaxing the hands. The cigarette will smoke.

Only the front half of a cigar band is used. It is glued to the cigar so that one side of the cigar shows a band, while the other does not. Wave the hand slightly, and draw back the thumb, thus giving the cigar one-half revolution, bringing the blank side to view.

A cigar is held in the right hand and attention is called to the ornamental band around the center. Suddenly the band disappears, while the cigar is held in full view.



No magnetic power is required to make a full sized cigar adhere mysteriously to the tip of your forefinger. A bent pin pushed through the cigar band is responsible. The point of the pin rests on the tip of the finger. In passing the cigar for examination, the band is removed and thrown away, while the pin goes with it.

You need two cigarettes, one for yourself and one for a friend, but when you open your cigarette case you find it empty. Close the case. When reopening it slightly and reaching inside, you remove two cigarettes, much to the astonishment of your friend. These have been concealed under the clamps.

Moisten the edge of a cigarette, press it down on the table, and it defies the laws of gravitation.

A cigarette is set on the edge of the table. A fountain pen previously rubbed on the coat is held beneath it and the cigarette topples from the table. Substitute a pencil for the pen, secretly blow upon the cigarette, and duplicate the effect.

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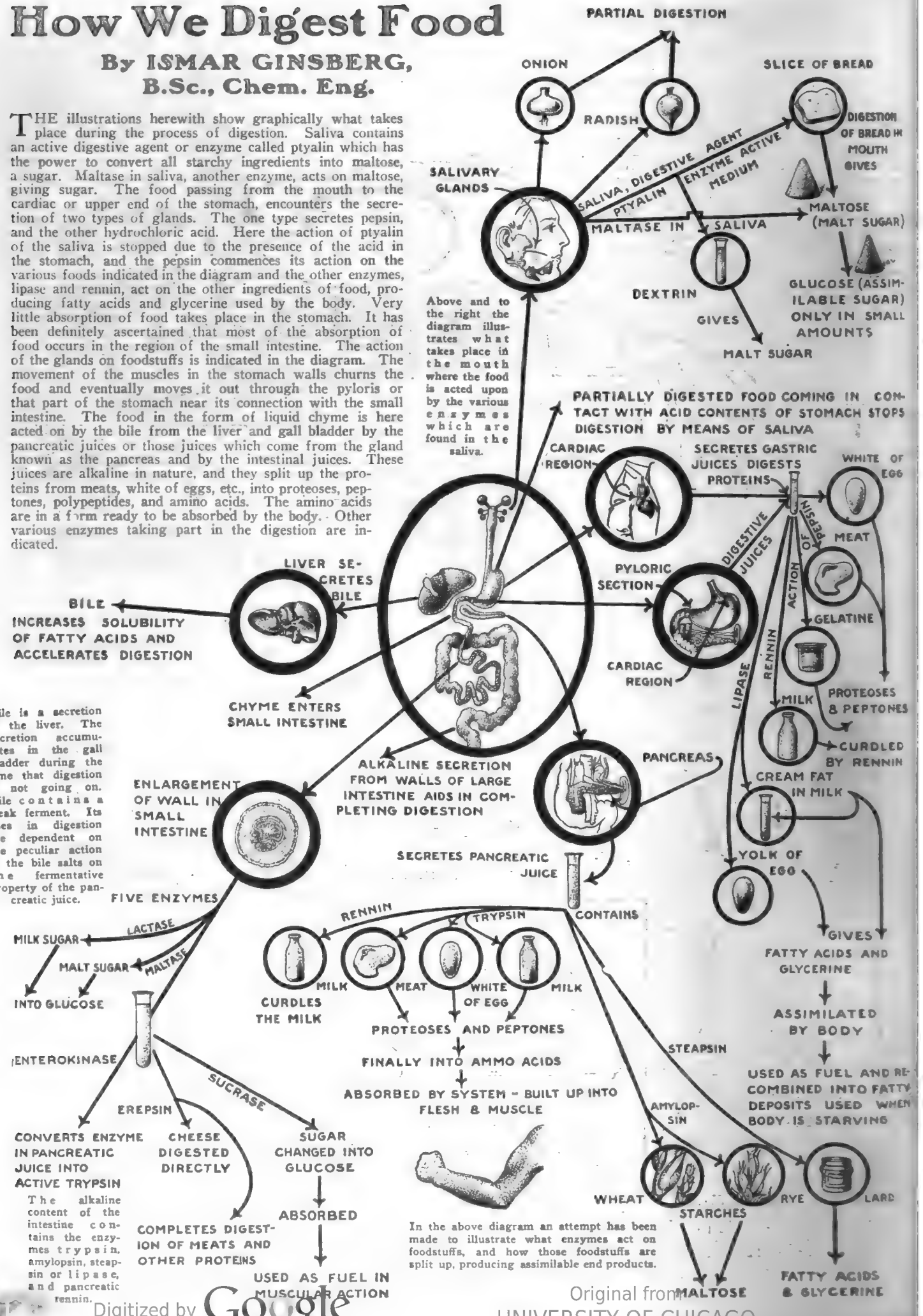
How We Digest Food

By ISMAR GINSBERG, B.Sc., Chem. Eng.

THE illustrations herewith show graphically what takes place during the process of digestion. Saliva contains an active digestive agent or enzyme called ptyalin which has the power to convert all starchy ingredients into maltose, a sugar. Maltase in saliva, another enzyme, acts on maltose, giving sugar. The food passing from the mouth to the cardiac or upper end of the stomach, encounters the secretion of two types of glands. The one type secretes pepsin, and the other hydrochloric acid. Here the action of ptyalin of the saliva is stopped due to the presence of the acid in the stomach, and the pepsin commences its action on the various foods indicated in the diagram and the other enzymes, lipase and rennin, act on the other ingredients of food, producing fatty acids and glycerine used by the body. Very little absorption of food takes place in the stomach. It has been definitely ascertained that most of the absorption of food occurs in the region of the small intestine. The action of the glands on foodstuffs is indicated in the diagram. The movement of the muscles in the stomach walls churns the food and eventually moves it out through the pyloris or that part of the stomach near its connection with the small intestine. The food in the form of liquid chyme is here acted on by the bile from the liver and gall bladder by the pancreatic juices or those juices which come from the gland known as the pancreas and by the intestinal juices. These juices are alkaline in nature, and they split up the proteins from meats, white of eggs, etc., into proteoses, peptones, polypeptides, and amino acids. The amino acids are in a form ready to be absorbed by the body. Other various enzymes taking part in the digestion are indicated.


PARTIAL DIGESTION
ONION
RADISH
SLICE OF BREAD
DIGESTION OF BREAD IN MOUTH GIVES
SALIVARY GLANDS
SALIVA, DIGESTIVE AGENT
PTYALIN
ENZYME ACTIVE MEDIUM
MALTASE IN SALIVA
MALTOSE (MALT SUGAR)
DEXTRIN
GIVES
GLUCOSE (ASSIMILABLE SUGAR) ONLY IN SMALL AMOUNTS
MALT SUGAR
Above and to the right the diagram illustrates what takes place in the mouth where the food is acted upon by the various enzymes which are found in the saliva.
PARTIALLY DIGESTED FOOD COMING IN CONTACT WITH ACID CONTENTS OF STOMACH STOPS DIGESTION BY MEANS OF SALIVA
CARDIAC REGION
SECRETES GASTRIC JUICES DIGESTS PROTEINS
WHITE OF EGG
PEPSIN
MEAT
DIGESTIVE JUICES
ACTION OF
GELATINE
LIVER SECRETES BILE
BILE
INCREASES SOLUBILITY OF FATTY ACIDS AND ACCELERATES DIGESTION
PYLORIC SECTION
CARDIAC REGION
RENNIN
LIPASE
MILK
PROTEOSES & PEPTONES
CURDLED BY RENNIN
CHYME ENTERS SMALL INTESTINE
Bile is a secretion of the liver. The secretion accumulates in the gall bladder during the time that digestion is not going on. Bile contains a weak ferment. Its uses in digestion are dependent on the peculiar action of the bile salts on the fermentative property of the pancreatic juice.
ALKALINE SECRETION FROM WALLS OF LARGE INTESTINE AIDS IN COMPLETING DIGESTION
PANCREAS
ENLARGEMENT OF WALL IN SMALL INTESTINE
CREAM FAT IN MILK
SECRETES PANCREATIC JUICE
YOLK OF EGG
FIVE ENZYMES
CONTAINS
RENNIN
TRYPSIN
LACTASE
MILK SUGAR
MALT SUGAR
MALTASE
INTO GLUCOSE
MILK
MEAT
WHITE OF EGG
MILK
CURDLES THE MILK
PROTEOSES AND PEPTONES
GIVES FATTY ACIDS AND GLYCERINE
ASSIMILATED BY BODY
ENTEROKINASE
FINALLY INTO AMMO ACIDS
STEAPSIN
USED AS FUEL AND RECOMBINED INTO FATTY DEPOSITS USED WHEN BODY IS STARVING
SUCRASE
EREPSIN
ABSORBED BY SYSTEM - BUILT UP INTO FLESH & MUSCLE
AMYLOPSIN
CONVERTS ENZYME IN PANCREATIC JUICE INTO ACTIVE TRYPSIN
CHEESE DIGESTED DIRECTLY
SUGAR CHANGED INTO GLUCOSE
WHEAT
RYE
LARD
STARCHES
ABSORBED
COMPLETES DIGESTION OF MEATS AND OTHER PROTEINS
USED AS FUEL IN MUSCULAR ACTION
MALTOSE
FATTY ACIDS & GLYCERINE
The alkaline content of the intestine contains the enzymes trypsin, amylopsin, steapsin or lipase, and pancreatic rennin.
In the above diagram an attempt has been made to illustrate what enzymes act on foodstuffs, and how those foodstuffs are split up, producing assimilable end products.

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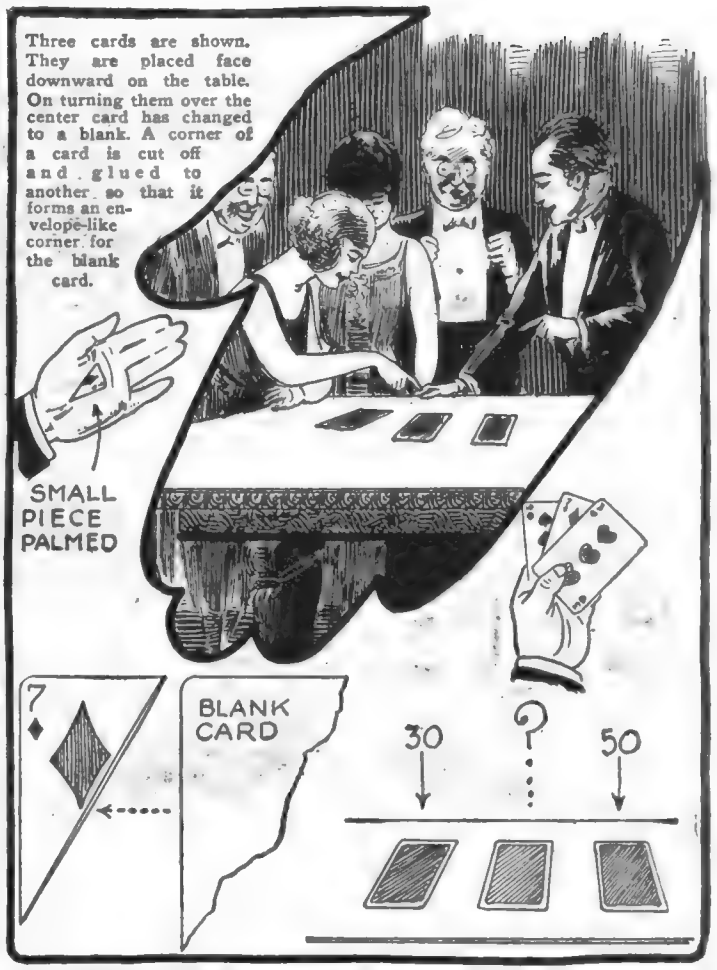
Magic for Everybody

By PROF. JOSEPH DUNNINGER

NO. 23 OF A SERIES

The magician has an extra large billiard ball in his hand. He invisibly tosses this on to a stand. The construction of the stand demonstrates how the trick is performed. When the assistant releases the string the air bag inflates a small rubber balloon.



Three cards are shown. They are placed face downward on the table. On turning them over the center card has changed to a blank. A corner of a card is cut off and glued to another so that it forms an envelope-like corner for the blank card.

The magician holds a large magnet. His assistant walks off with a large ball and releases the ball in air, which floats toward the magnet. Actually the ball rolls along two thin threads.

The performer loads a handkerchief into a pistol. A wand is suspended in midair and the performer fires at the wand. The wand contains the handkerchief. An assistant pulls it into view.

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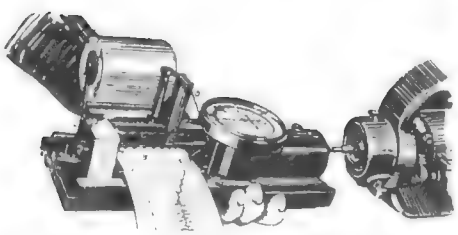
Soap Doll Actor

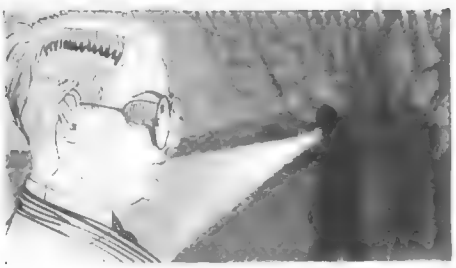
Here is a movie actor whose head is made of soap. In filming a recent fairy tale, the director came face to face with a very serious problem. He could find no actor of sufficiently grotesque face and form to act a certain part in the piece. As a result an ingenious art director hit upon the scheme of carving hobgoblin's head from a bar of soap, placing it on a small frame as shown at the left, and dressing it up to imitate the character to be shown. The picture of the doll was filmed against a dark background. The other characters meeting the doll were also filmed against a black background. The two were made on separate negatives using only half the film. Both negatives are printed on same positive, giving a single picture.—L. J. Wilson.

Tachometer



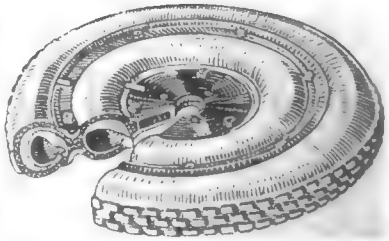
The tachometer shown in the above illustration records the speed of the machine being measured, showing variations in it.

For Walkers



For night walking this device uses two electric bulbs in parabolic mirrors attached to eye glasses. (Author send address).

English Tire



The use of a dual air chamber in automobile tires allows a thicker tread and much easier riding.

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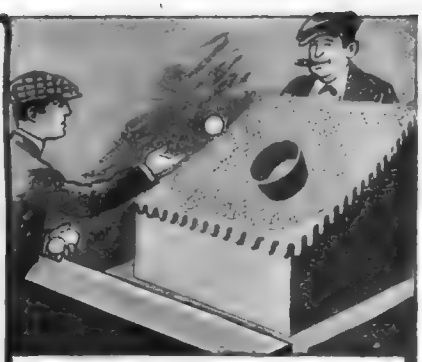
More Gambler's Tricks Exposed

By MARK MELLEN

The Man Who Fooled P. T. Barnum

ON this page we show a number of mechanical devices and contraptions that are often used to fleece the would-be "wise guy." There are quite a few concerns manufacturing the devices shown here. For those in the "know," blueprints are supplied demonstrating how the devices work. The story about the Goddess of Chance which gives each and every player an equal opportunity of winning a large prize is pure bunk. One might just as well place the head and shoulders of a beautiful woman on a stand as illustrated below, and put the sack of easy money in her hand. Then as the crowds try to embrace her the crooks do their work by removing the gold from the pockets of the swelling crowd. Of course, the gambling devices illustrated are more legitimate. They are painless methods of extracting cash from the pockets. The gambler is not a philanthropist. No doubt he lets you win two or three or four times in succession, or he may even let you win for one or two days until you have imbibed the spirit of the thing, and then one day "luck" runs against you, and you lose a little more than you won. You try to recover the loss and continue to lose more. Then you become convinced that the Goddess of Chance never smiled at you and are about to forget the game forever when you make a "killing," and regularly thereafter you win once and lose a dozen or more times, so unless you know more about it than the other fellow, keep out of the game.

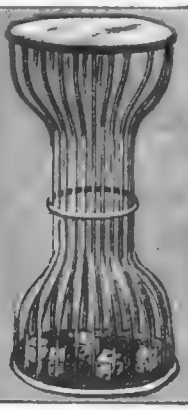
The advertisement of the Tumble Bug reads: "Get the bug and get the jack. This is a two way store under control at all times." Pressure on a screw regulates the size of the slot, making it impossible for the bug to enter the lower end of the trough.



Pop in the bucket shown above is a direct descendant of the old Huckley Buck family. It looks easy to win—and it is, when the operator wants you to win. The ad states that "the outfit can be regulated and demonstrated by the operator at all times." By tilting the bucket a little less, the operator can cause you to win or lose.

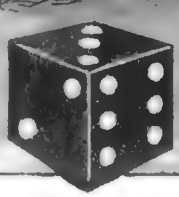
The advertisement of the Chinese Dice Box reads: "Shake the dice without removing the cover from the box and name the faces on the dice that are up." A dice box of this nature is well worth the price charged for it if you can induce anyone to bet with you. You always win. The dice can only turn over once for each shake of the box. In two shakes the faces on the bottom will be on top.

The trip dice box "trips" the dice as they are rolled out and causes them to turn over, thereby frustrating the efforts of anyone who may try to slide them out instead of rolling them. Suckers think the game must be on the level. They don't realize that the dice may be controlled after they leave the box.



The hand cage illustrated above is generally used in playing hyronemous or hazard. It is seemingly impossible to manipulate the dice inasmuch as they are kept in the cage. cage.

If there is any doubt in your mind as to whether or not it is practical to control dice by means of an electric current, we advise that you look at the illustration below. The advertisement reads: "The electro-magnetic coil is placed in a wooden case 9 inches square, 2 inches deep, and is fitted with an extension cord and connecting plug which will fit any ordinary light socket. The magnet is controlled by an extra heavy switch and will pull through one inch of wood controlling a space 6 inches square."



The platinum filled transparent dice illustrated above is used where suckers cannot be steered into an establishment containing a magnetically controlled dice table upon which the player has no chance. The dice here illustrated is loaded with platinum. Being so loaded the cheater brings his suckers to any place at all, and if they are willing to bet against him, he removes their surplus capital.

An electric control for the hand cage may be purchased for a mere addition of $50.00. The dice in the cage are loaded with steel shavings and as usual the sucker has no chance. The rubber dice mat illustrated below is used to cheat the cops rather than the players. Elimination of noise prevents officers of the law making an arrest—or a collection.

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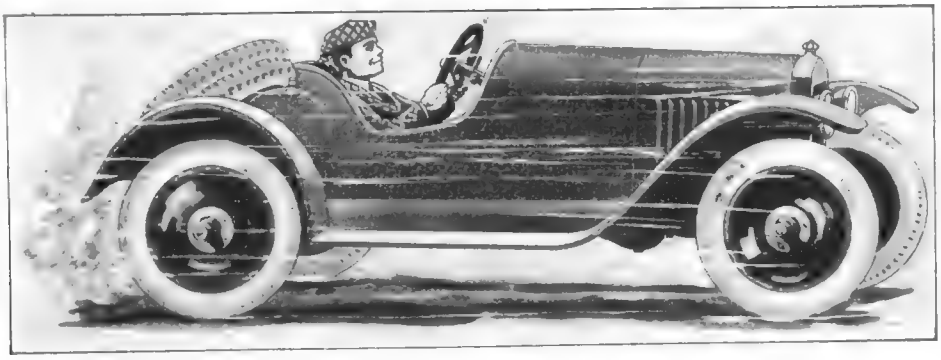
THE CONSTRUCTOR

Building a Motor Speedster

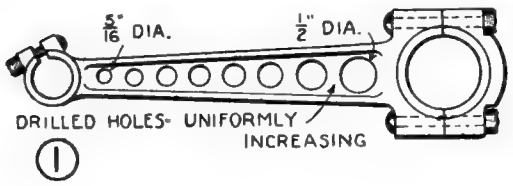
Specially Prepared by
GEORGE ARTHUR LUERS

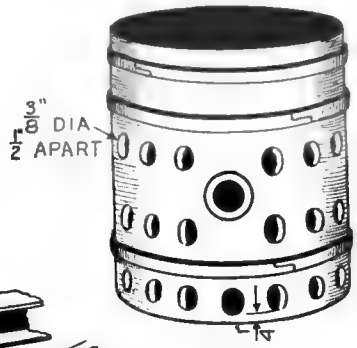


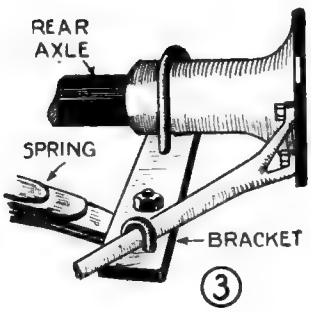
WHO, with any sporting blood in their veins, can resist the lure of a snappy, low hung sport car? Probably every one of us has at some time or other had a burning desire to own and operate a car of this type. The cost of such an outfit, ready built, has deterred most of us from the realization of this dream. However, we are showing on this and the opposite page just how a fast auto speedster can be made from a Ford chassis and a few parts that an ordinary mechanic can make. A few inquiries in the proper direction will soon make evident the fact that a second-hand Ford chassis can be purchased very cheaply, sometimes as low as $15.00.

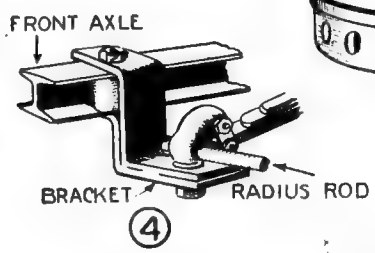
The first operation is to place the engine and chassis in good mechanical condition. Clean it thoroughly and when finished, give it a coat of black enamel in order to preserve it. Before starting work on the body, the engine must be changed. The main idea is to reduce the weight of the reciprocating parts, namely, the piston and connecting rod. This can be done as shown in Figs. 1 and 2 herewith. It is advisable also to use two gaskets under the lower crank case cover, which increases the oil supply in the troughs.

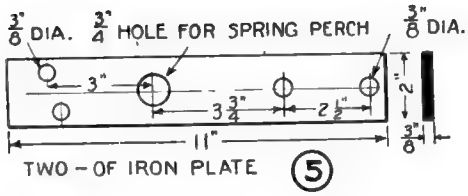
The next work is to undersling the chassis. Strap iron bent and drilled as shown is the only necessary material. The details for the front and rear axles are shown in Figs. 3 and 4, and the various parts in Figs. 5, 6 and 7. A brace which will make the front axle more rigid is shown in Fig. 8. In order to undersling the chassis, it is necessary to cut five inches off the frame, as shown in Fig. 13. The steering gear must be lowered. Use is made of a wedge, Fig. 9, and extension straps to the steering post flange, Fig. 12. An oak dashboard is to be made, Fig. 10, and placed in position with braces, Fig. 11.

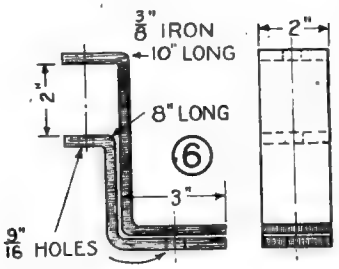


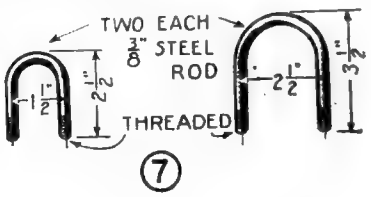


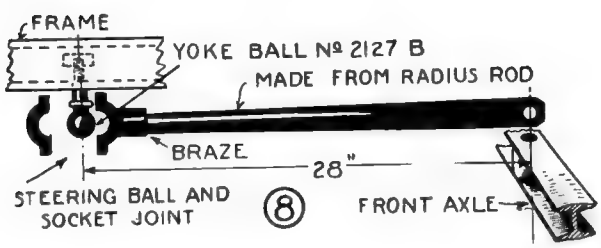


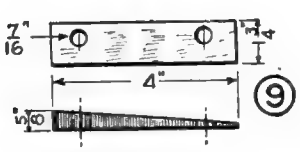


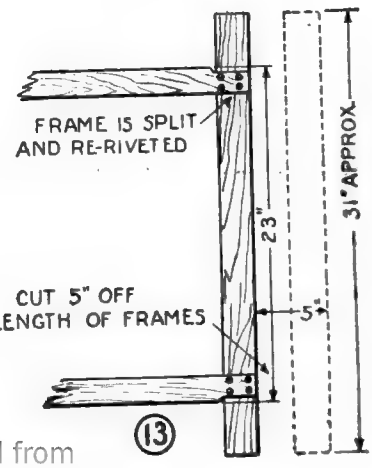


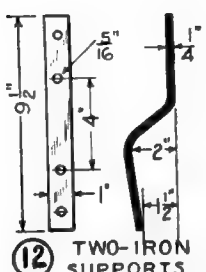


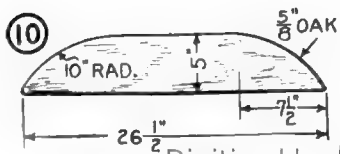


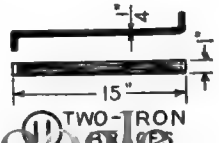












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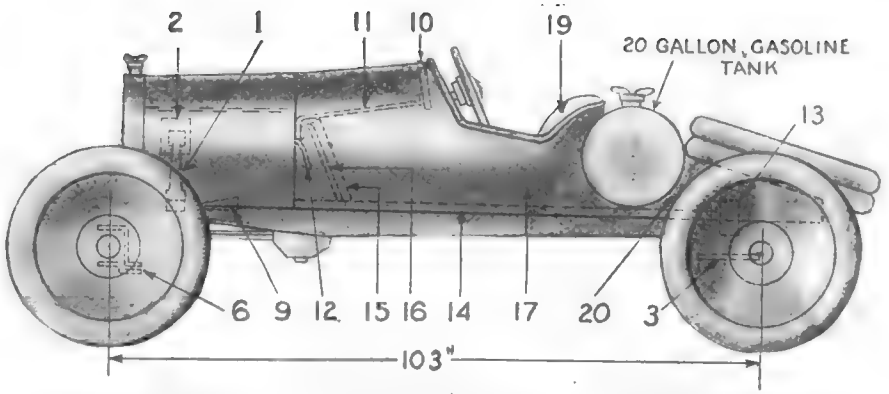
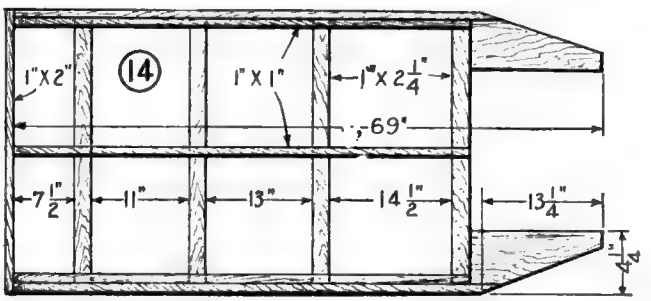
AFTER the engine and chasis changes, illustrated on the opposite page are completed, the body must next be built. All the details are given herewith. First, a frame is made up, Fig. 14, using screws for fastening together. Foot boards are shown in Fig. 16, which are to be fastened with braces made of strap iron as shown in Fig. 15. The body and the cowl are the next consideration. A pattern is given in Fig. 17, which should be reproduced in full size on a large sheet of paper. This pattern can then be placed over the metal to be used, and the latter carefully cut to the correct size. This casing is to be secured to the frame at the edges and to the dash by small large-head nails placed one inch apart. The metal may be cut in one piece as shown, or in several pieces, riveting together at the junctions. For appearance, it is desirable to bead the edge of the metal by turning it over a stiff wire. The details of the seat and upholstery are given in Fig. 19 and of the tool box and gasoline tank support in Fig. 20. Fig. 18 shows how disks for the wheel can be cut from galvanized iron.

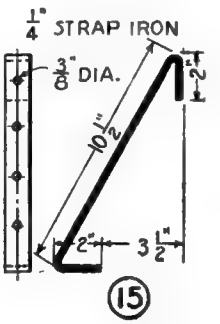
One other point that is desirable to observe in order to get the greatest speed out of this car is the muffler. It should be removed and the inside shelves taken out. This procedure will reduce the back pressure and increase the power of the engine.

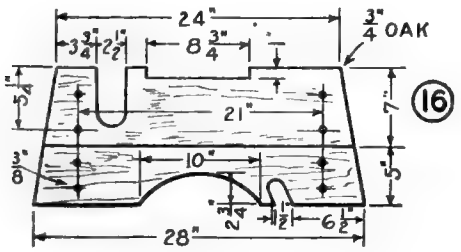
After the entire assembly is made, and a special twenty gallon, or the regular ten gallon tank, placed in position, the entire outfit should be carefully painted. First use a lead priming coat, sandpaper it and use one coat of color enamel. Rub this down with steel wool and apply a second coat, again rubbing this down with steel wool. One or two coats of varnish give an excellent finish. A white ivory body with black trimmings makes an excellent finish for this car.

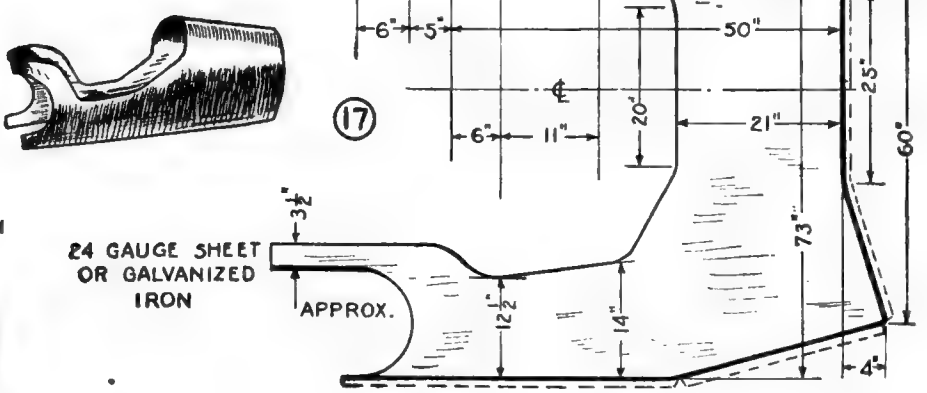


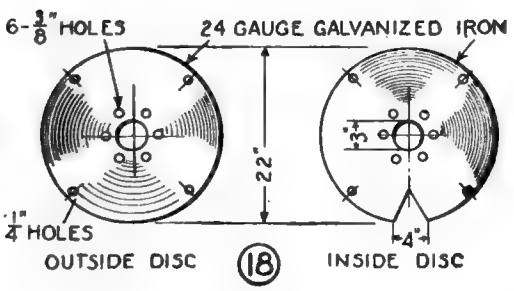
The above illustration shows a complete assembly view of the motor speedster. All of the changes or new parts are numbered, the numbers corresponding with those given in the other illustrations. A sixteen valve engine head, sold on the market, will increase the power remarkably.

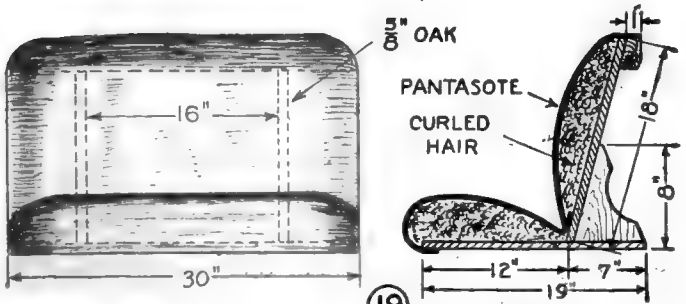


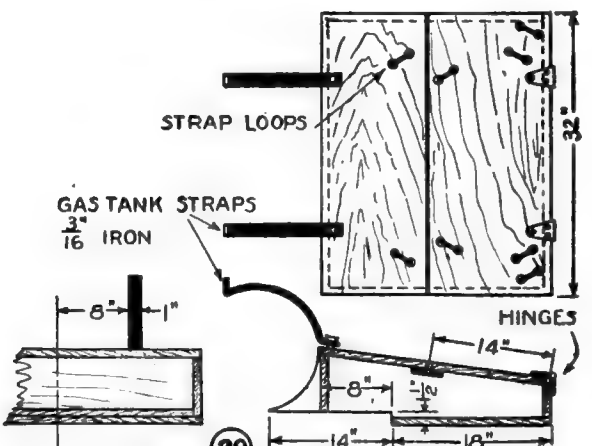












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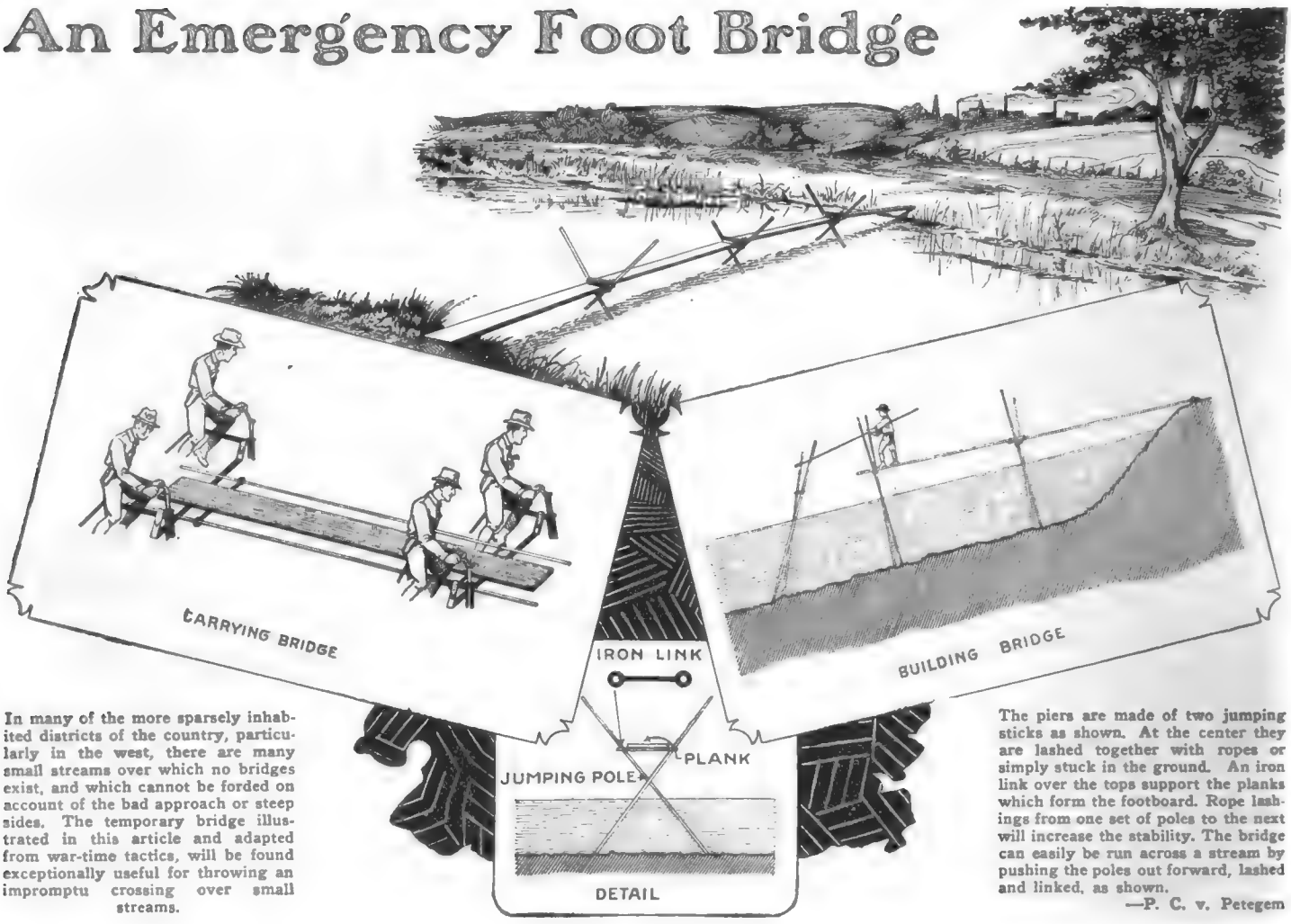
An Emergency Foot Bridge

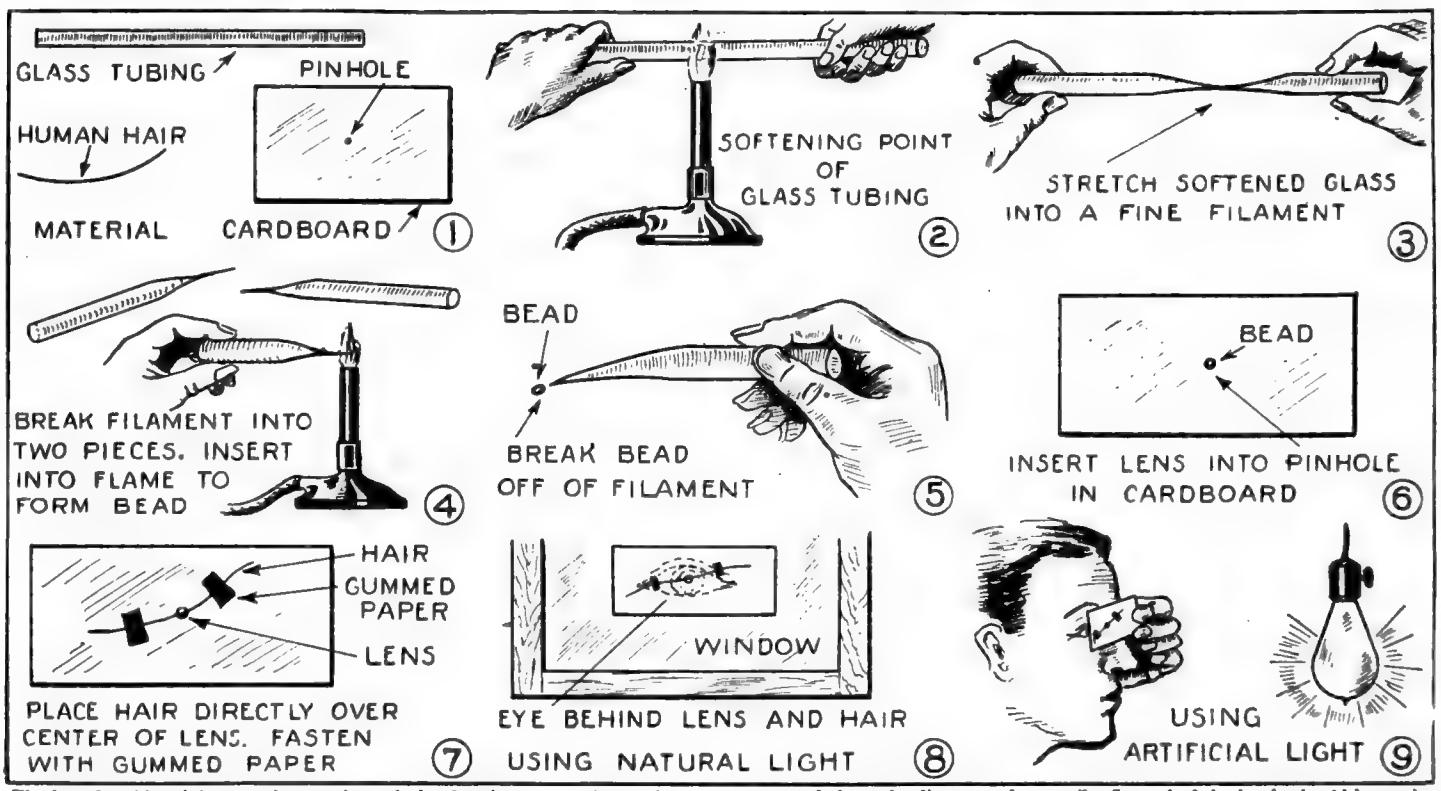


In many of the more sparsely inhabited districts of the country, particularly in the west, there are many small streams over which no bridges exist, and which cannot be forded on account of the bad approach or steep sides. The temporary bridge illustrated in this article and adapted from war-time tactics, will be found exceptionally useful for throwing an impromptu crossing over small streams.

The piers are made of two jumping sticks as shown. At the center they are lashed together with ropes or simply stuck in the ground. An iron link over the tops support the planks which form the footboard. Rope lashings from one set of poles to the next will increase the stability. The bridge can easily be run across a stream by pushing the poles out forward, lashed and linked, as shown.

—P. C. v. Petegem

Small Microscope from Glass Beads



The lens for this miniature telescope is made by drawing out a glass rod over a flame. When the softened rod is stretched and broken in two, one of the fine ends is held in the flame again, so that a bead is formed. This bead is placed in a pin hole of the proper size in a sheet of cardboard. If a hair is placed across the top of the lens directly against it, as illustrated, the hair will appear of about the diameter of a pencil. Several of the beads should be made, and the one being most free from bubbles, should be used. Selection is made by experiment. Since the lens has an extremely short focal length, it will be necessary to place the object directly on top of the lens and to hold the lens as close to the eye as possible.

—Edw. Kuwatch, Jr.

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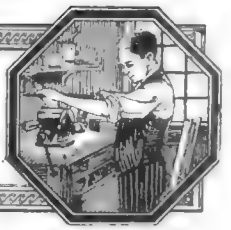
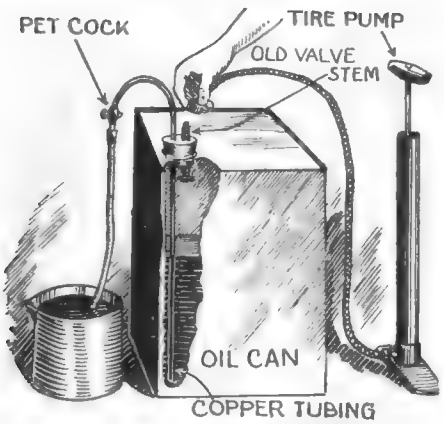
HOW-TO-MAKE-IT



This department will award the following monthly prizes: First prize, $15.00; second prize, $10.00; third prize, $5.00.
The purpose of this department is to stimulate experimenters toward accomplishing new things with old apparatus or old material, and for the most useful, practical and original idea submitted to the Editors of this department a monthly series of prizes will be awarded. For the best idea submitted a prize of $15.00 is awarded; for the second best idea a $10.00 prize, and for the third best a prize of $5.00. The article need not be very elaborate, and rough sketches are sufficient. We will make the mechanical drawings. Use only one side of sheet. Make sketches on separate sheets.

Liquid Dispenser

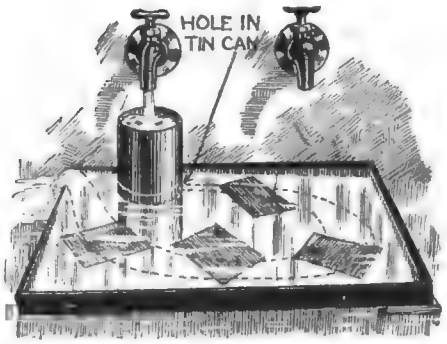
FIRST PRIZE $15



Liquids in large cans can be readily dispensed by using the system outlined above. Air pressure developed by the tire pump forces the liquid out. The flow may be stopped when desired by the pet cock. —L. J. Smith.

Print Washer

SECOND PRIZE $10



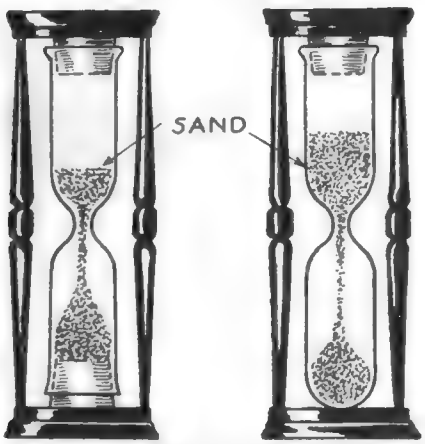
A very handy print washer for the amateur photographer can be made as shown above. A hole is punched near the bottom of the tin can which is then placed in the washing tray. Water is allowed to run into the can and to escape over one edge of the tray. The hole in the can creates a current of water that thoroughly washes the prints.
—Author please send name.

Tire Tool

THIRD PRIZE $5

Rubber bands will repair bicycle tire punctures. Coat the bands with rubber cement, insert in hole, remove tool. Cut bands flush with tire when dry. —Milton White.

Time Glass

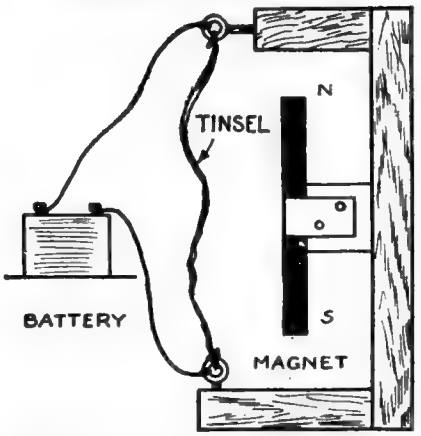


The time glass illustrated above will serve many purposes. It consists of either a glass tube or test tube, heated and drawn out as shown. The amount of sand is determined by experiment. —F. R. Newton.

Hammer Kink

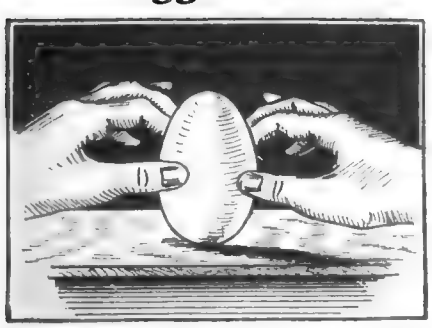
For driving nails in out of the way places, drill a hole in the hammer as shown above. The nail is held in position by a bit of beeswax. It can then be driven into the wood without the usual bruising of the fingers. When the nail is started, the hammer can readily be removed from it.
—Florence E. Moore.

Magnetic Snake



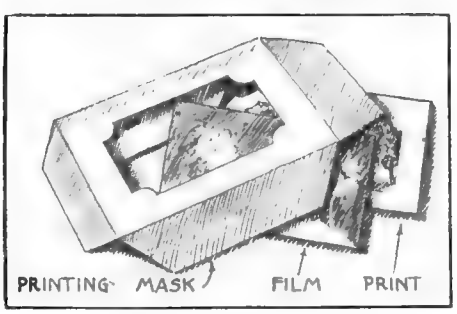
A piece of tinsel suspended as shown above will perform violent contortions when current is passed through it. Also try reversing the current. —S. Leonard Bastin.

Egg Trick



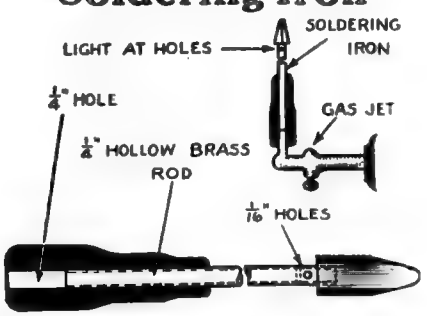
Hold an egg as shown above for a moment or two. The yolk will settle and with a little manipulation the egg will balance perfectly.
—C. L. Walter.

Printing Mask



A satisfactory printing mask may be made from an envelope as shown above, cutting the face of the envelope to the desired shape.
—A. P. D'Ambra.

Soldering Iron



A soldering iron made as shown above can be quickly and easily heated over a gas jet. The flame ascends through the brass rod.
—George A. Coates.

(This department will be continued under regular $1,000.00 contest rules next month.)

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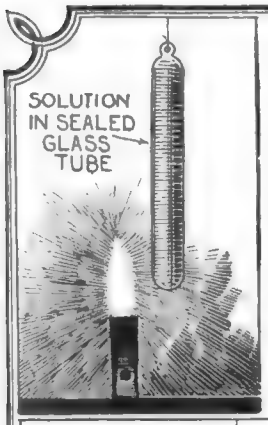
WRINKLES
RECIPES & FORMULAS

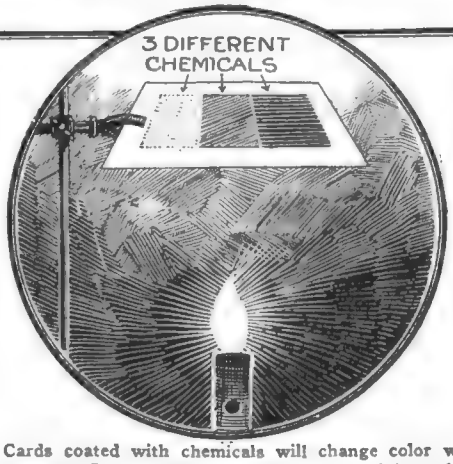
Edited by S. GERNSBACK

Novel Experiments with Heat

By EARLE R. CALEY, B. Sc.

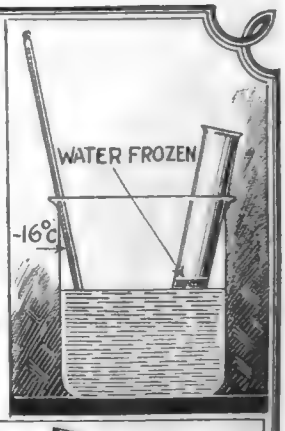


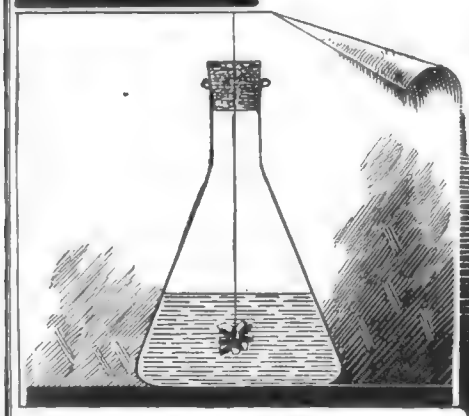
A strong solution of cobalt chloride in alcohol when placed in a tightly stoppered bottle or a sealed tube, serves as a heat indicator. At ordinary temperatures the solution is pink, but upon being heated it passes through different shades of purple, until near the boiling point of water, it becomes blue.



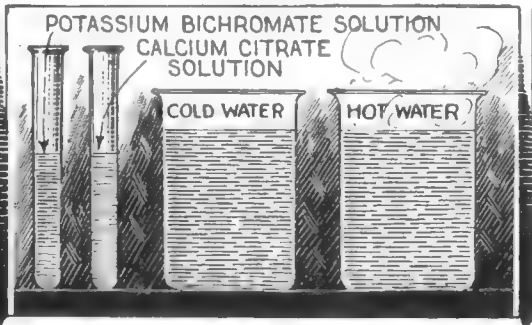
Cards coated with chemicals will change color when heated. Cobalt chloride changes from pink to blue, cobalt iodide from pink to green, mercuric iodide from red to yellow.

An interesting experiment in freezing water may be performed by melting together six parts of tin, ten of lead, and eighteen of bismuth. Powder this alloy finely and pour it into a beaker containing eleven parts of mercury. The temperature of the mixture will drop to —16° Centigrade, and a thin walled test tube of water placed in the mixture will be frozen.

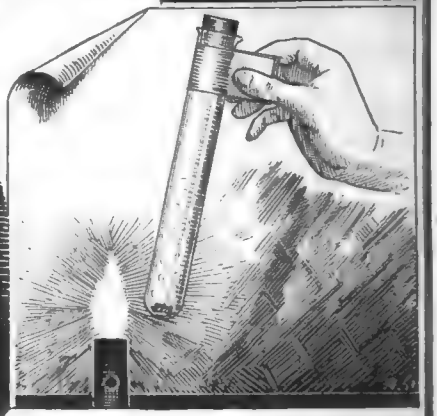




"Hypo" when melted in a flask which is then corked will remain liquid. However, if a wire holding a bit of hypo is introduced into the flask, beautiful crystals will form.

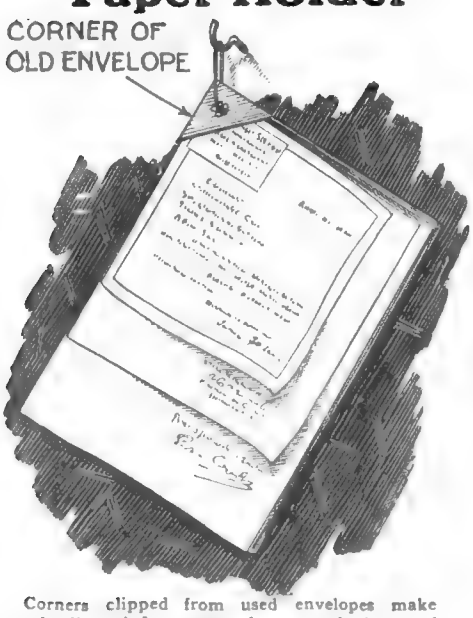


A cold saturated solution of calcium citrate will be precipitated by heat and potassium bichromate will be dissolved thereby. Put the substance in test tubes with beakers of water to give temperatures.



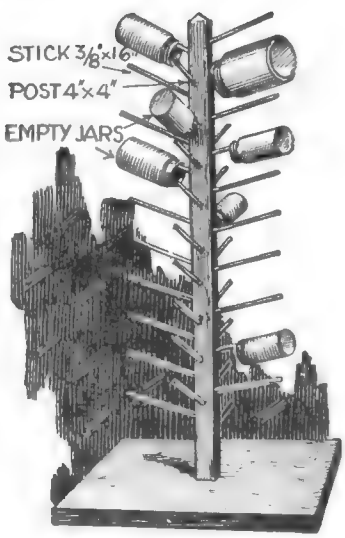
Place crystal of iodine in stoppered test tube. Heat produces intense violet colored vapor. Cooling reverses the phenomena, the color weakening.

Paper Holder



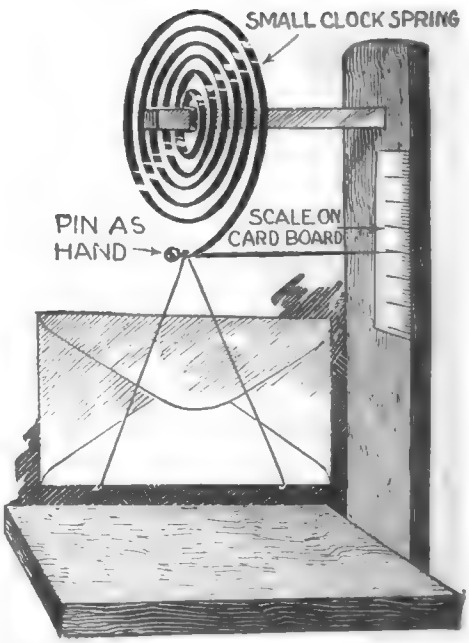
Corners clipped from used envelopes make splendid reinforcements for several sheets of paper clipped together as shown above.
—S. Schlesinger.

Jar Rack



A piece of lumber 4 x 4 in which dowels are placed as shown at the right makes an excellent rack for holding empty mason jars, so that they will be out of the way.
—E. M. Quimby.

Letter Scale



A small clock spring mounted as shown at the right when provided with a loop of wire for holding envelopes makes an excellent letter scale. (Author send name.)

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Readers Forum

THE INHABITANTS OF MARS

Editor, *Science and Invention:*

I am rather a "bug" on astronomy and that is the main reason I have many of your magazines saved up. I would like to know why scientists say that no people inhabit Mars. If the earth has inhabitants, why not Mars? Mars may be a dying planet but it still can have people on it. The gravity has nothing to do with it. The climate, most likely the people are built to endure. Dried out seas may be like very large canyons. When Mars was nearest us last, August 22nd, some scientists reported having heard queer sounds and had seen greenish-yellowish flashes. Other scientists scorned it. You must remember that the inhabitation idea is only a theory, not an actual proof. I believe an astronomer only knows what his telescope can show him. Is there any so powerful that it can detect people? Cameras only show blurs of Mars.

JESS WAY,
New York City.

(There is one group of scientists who believe in the inhabitation of Mars. This group was undoubtedly led by the famous, now dead, astronomers, Percival Lowell and G. B. Schiaparelli, and the other group does not believe in Mars' inhabitation. For the sake of balancing arguments, both in favor of Mars' inhabitation and against that view, we must first take into consideration the known facts concerning this much discussed planet. Mars is about one and one half times further from the sun than we on this earth are. Its orbit is very eccentric, and its distance from the sun varies as much as 26,000,000 miles. At its nearest approach to the sun, Mars is more than 128,000,000 miles from that luminary, and at its greatest distance 154,000,000 miles away. If we take the mean distance of Mars, we find that it would take light 12½ minutes to travel to the planet from the sun. This planet has a very light atmosphere, and consequently the heat which it obtains from the sun is not retained, and there must be extreme changes in temperature. Mars rotates on its axis in 24 hours, 2⅝ minutes and 23 seconds. This makes a day on Mars approximately 40 minutes longer than our own day. Its axis is inclined to its orbit about 24 degrees and 50 minutes, which is a little more than the inclination of the earth's axis, which is 23 degrees and 27 minutes. Mars, therefore, has seasons which are very much like ours, but the seasons are slightly more marked and are nearly double the length of the terrestrial period, because it takes Mars nearly two of our years to make its journey once around the sun, which would be one year for Mars. Its seasons then are six months long, while ours are but three. As on the earth, there are torrid, temperate and frigid zones, and like the earth, it is furthest away from the sun; when there is summer in the northern hemisphere, the temperature on the planet is much warmer because of its proximity to the sun. The main surface of the planet is reddish yellow in color, and there are patches on it that are blue, grayish green or gray, or a combination thereof. Schiaparelli, the eminent Italian astronomer, pointed out that there were greenish streaks all directed to so-called seas. He called these streaks canalli, which when properly translated means channels, but when it appeared in English publications, the translation was changed to canals. This immediately started the controversy over the inhabitability of Mars, because canals as we know them, are artificially produced, and if artificially produced, then intelligent beings must have built them. Another view entertained is that these so-called canals are vegetation canals.

The drawings of the canals were given in the December issue of SCIENCE AND INVENTION MAGAZINE, *on page 771. Here twenty-two triangular canal terminals are shown, which were first observed at the Lowell Observatory at Flagstaff, Ariz., in the year 1894 and '95. On this map the light areas are continents and islands of white, red and yellow inorganic soil. The dark areas are dry sea beds and lake beds, and the vegetation canals are assumed to be rivulet valleys, all of which get their dark color from the residue, black organic soil of the planet, which shows more conspicuously when wetted seasonally with moisture from the polar caps. The dark triangular canal terminals shown at the seashore line, are now held to be dry organic black mud deltas, the last deltas made by once running rivers. That the last Martian sea wrote its history with deltas, drain sumps and valleys of dark soil is the assumption of Lowell and Schiaparelli. The same applies in the case of Lake Bonneville. The only difference is that the Martian drain sumps are dry, while those on Lake Bonneville are still in operation. It is probable that the only water which appears on Mars is that which is obtained from the polar caps. The few clouds which can be seen most of the time, may be due to water vapor, as the clouds we see ordinarily are, or they may even be dust clouds, but in either case, the planet would have to have air currents to move those clouds. Consequently one can reasonably assume that Mars has an atmosphere even though the atmosphere is scant. The famous polar caps are of uncertain origin. They appear in the winter season on the planet, and disappear in the summer; so they are in some way dependent on the temperature in the polar regions. If they are hoar-frost or snow, they are condensations of water vapor, and when they disappear, there must be sufficient heat to melt them, but the normal temperature of an unprotected body at the distance of Mars from the sun is about 32 degrees below zero Fahrenheit, and since Mars cannot retain much heat because of its thin atmosphere, it could be assumed that the polar ice caps are not snow, but may be carbon dioxide deposits which condense into a white substance at a temperature of minus 109 degrees F. The mean temperature of the planet Mars is not assumed to be higher than 48 degrees F. This would make it difficult for vegetation to grow, unless that vegetation differs from vegetation as we know it on this planet.*

The editors believe there are as many arguments in favor of the inhabitation of Mars as those against it. Scientists like to speculate and we see no reason why other planets should not be inhabited the same as ours. Should anything of a more definite nature be learned at any time, the readers of SCIENCE AND INVENTION MAGAZINE *will be the first to get the information.*

Summarizing, one may state that it is now believed that water and vegetation exist on Mars. Air is present, and perhaps some form of animal life exists there also, which if it progressed along the lines of evolution on this planet, must be considerably more intelligent than our own group of human beings.

SCIENCE AND INVENTION desires to hear from its readers. It solicits comments of general scientific interest, and will appreciate opinions on science subjects. The arguments pro and con will be aired on this page. This magazine also relishes criticisms, and will present them in both palatable and unpalatable forms. So if you have anything to say, this is the place to say it in. Please limit your letters to 500 words and address your letters to Editor—The Readers Forum, c/o Science and Invention Magazine, 53 Park Place, New York City.

The Experimenter

has come back! If you are one of the one hundred thousand readers of the old ELECTRICAL EXPERIMENTER, you will no doubt be glad to hear that the EXPERIMENTER is coming back BIGGER AND BETTER THAN EVER. PRACTICAL ELECTRICS has been changed into an entirely new kind of magazine entitled

The Experimenter

In this magazine which has been greatly enlarged in point of contents, illustrations and circulation, you will find the following new departments:

Experimental Radio
Experimental Chemistry

There is an entirely new treatment of radio containing experiments only. *90% of the magazine contains pure experiments* written by the foremost authorities in their respective fields, also a monthly editorial by the writer.

A fine roto-gravure section is now added to brighten up the magazine. *If you want experiments, this is your magazine.*

Be sure to reserve a copy from your news-dealer before the issue is sold out. THE EXPERIMENTER will be on sale at all newsstands beginning January 20th, 1925.

Hugo Gernsback
Editor

As to seeing Martians through a telescope, this at present is impossible. An object to be seen on Mars must be at least 30 miles square.—Editor)

BOTH SCIENCE AND RELIGION

Editor, *Science and Invention:*

I have just read the letter by A. M. Riordan in the *Readers' Forum*, and would like to make a few comments.

In the first place Mr. Riordan does not understand evolution. That is obvious from the way he writes. Evolution does not conflict with the teachings of the Bible. God created man—but how? In one day, yes—but how long was that day? "A day is as a thousand years with the Lord." Science says that life started with a single cell. If science is correct then that was God's way of creating. The Bible does not say how long each day of the six days required to create heaven and earth were. Why could not God have created everything in an instant? He chose the way we call evolution. That, man at one time looked more like an ape than like a man, is absolutely proven proof: The human skull used to be nearly flat across the top; man had a larger, flatter nose and a heavy set jaw, much like the ape of today. Man was covered with a coat of hair, and would be today if it were not for clothing. There are many other things that go to prove evolution. The kind of evolution that W. J. Bryan makes fun of has nothing to do with science, and never did have. Any broadminded person can see that evolution and the Bible agree with each other yet there are a few who do not want to understand and will continue to think that evolution is "unprovable," etc., when a little thinking would set them right.

R. B. MEEKER,
Holland, Mich.

(This opinion on the part of another reader is likewise entertained by many evolutionists who can abide at once by the laws of Science and the Church at the same time. A radical, sane thinker is a worthy individual and a man who upholds his belief in the face of odds is doubly worthy. Those who profess to be scientists and then take a biased view of everything else, non-scientific, are not worthy of consideration and the same holds true for over-zealous religionists who can see nothing but from their own point of observation, and treat all others who do not agree with them as bigots. Fortunately, the world is made of a vast majority of the type of men similar to the writer of the above letter.

It is good to remember that the other man is right part of the time. The rational individual will listen to and correct opinions if he knows a little more about the subject than the person with whom he is holding a conversation. He must, however, open his own mind to the logic and reasoning qualities of his opponent in a discussion and accept those parts of the arguments which best his own and overcome his objections.

Again we repeat as we have done so in past issues—"One does not have to overthrow the laws of state and religion to become a scientist" —the above letter confirms it again.—Editor.)

DOESN'T LIKE JOKE EDITOR

Editor, *Science and Invention:*

Some time ago I sent you a joke about a doodle bug. I have never heard any more about it. I think it's about time that you give us fellows that never had an education a chance. I can't see that it's necessary for a man to be a professor or a college teacher to win a prize. I think I can write as good a joke as any college professor and then some. I think it's all a swindle. Take the joke I saw in your magazine about radio sounding like a cook snoring. Now I know that no radio set ever sounded that way. I've asked lots of people who have radio sets if their sets ever sounded like a cook snoring, and they all said no. I don't understand how you publish such jokes when good jokes like mine you don't even look at.

N. COMPTON,
Greenville, Ohio.

(No doubt you feel peeved because we returned some of your jokes as unavailable. The reason for our rashness was that your jokes needed an explanation, in other words, they were very deep and the joke part could not be easily perceived; in fact in some of them one could not see the joke at all. Now if you will give us some really good jokes, we will be glad to publish them and pay you for the privilege at the same time. Don't worry about us not looking at jokes. We look at everything, and this answer proves that your jokes—alas—were also read personally by the writer. And believe us it is no joke to wade through 3,000 would-be jokes every month!—Editor.)

QUESTIONS JUDGES' OPINIONS

Editor, *Science and Invention:*

About eight months ago I sent in three articles to your magazine. They were returned to me marked "not of general interest." Imagine my surprise when on picking up the November number of SCIENCE AND INVENTION I found an article that was practically a duplicate of one of my articles which was returned to me with reason above marked. Evidently your idea of "general interest" has changed.

Your distinction in your Gold Cover Contest seems to be extremely fine. In the contest announcement you gave a square box covered with gold paper as a suggestion and give sixth prize to a round box; you suggested picture frames and give a prize to a picture frame which has a drawer for stamps as an addition. It seems to me that these prizes come under the list of those excluded in the prize announcement.

RICHARD WHITTINGTON,
Crawfordsville, Ind.

(*Continued on page* 1032)

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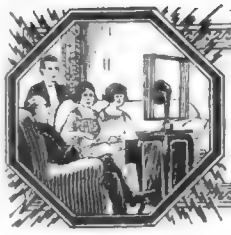
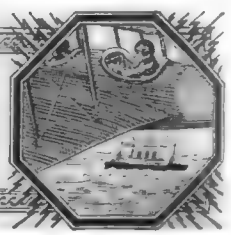
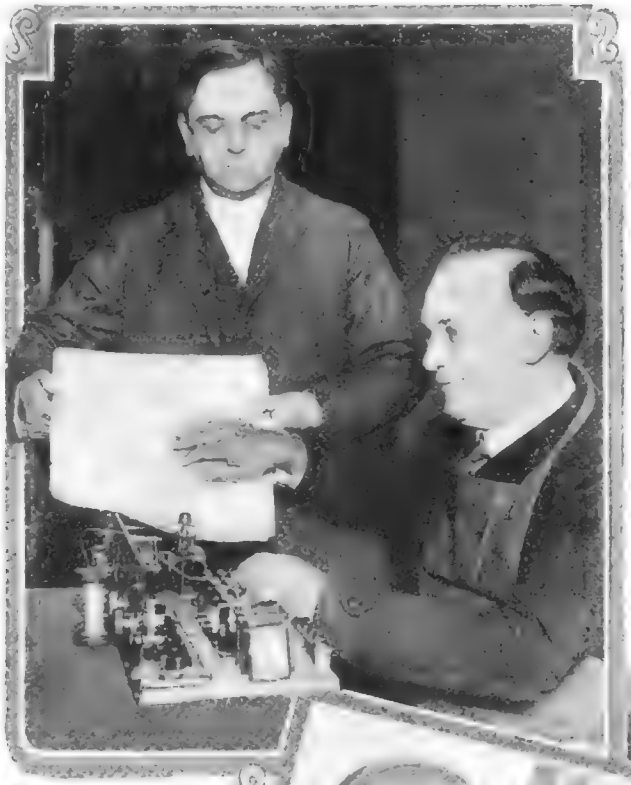


RADIO



Radio Pictorial



A blind radio genius of San Francisco, Harry Scott shown with a set he constructed using the new Braille blueprint system which brings the joys of radio construction within the reach of those afflicted. To those not acquainted with the system, it seems slow and tedious. However, this is not the case.

Above: The thriving little town of Larchmont, N. Y., now boasts of a very efficient and complete radio broadcasting set for the use of its Police Department. With a range of 600 miles, a law breaker will have to move quickly in order to escape capture. Left: Thanks to a decision handed down by the District Court of Appeals giving him credit for his invention, Dr. James Harris Rogers, famous radio inventor, has won an involved controversy between himself and the government. The aged inventor, famous the world o'er for the development of the underground antenna, is shown adjusting the submarine radio transmitter, used by the Navy during the war.

Talk about novel home-built radio receivers! The one shown at the right is made entirely from sour milk—a casein product. Coloring pigment of the desired tint is added before the milk hardens. In this way a beautiful effect is obtained.

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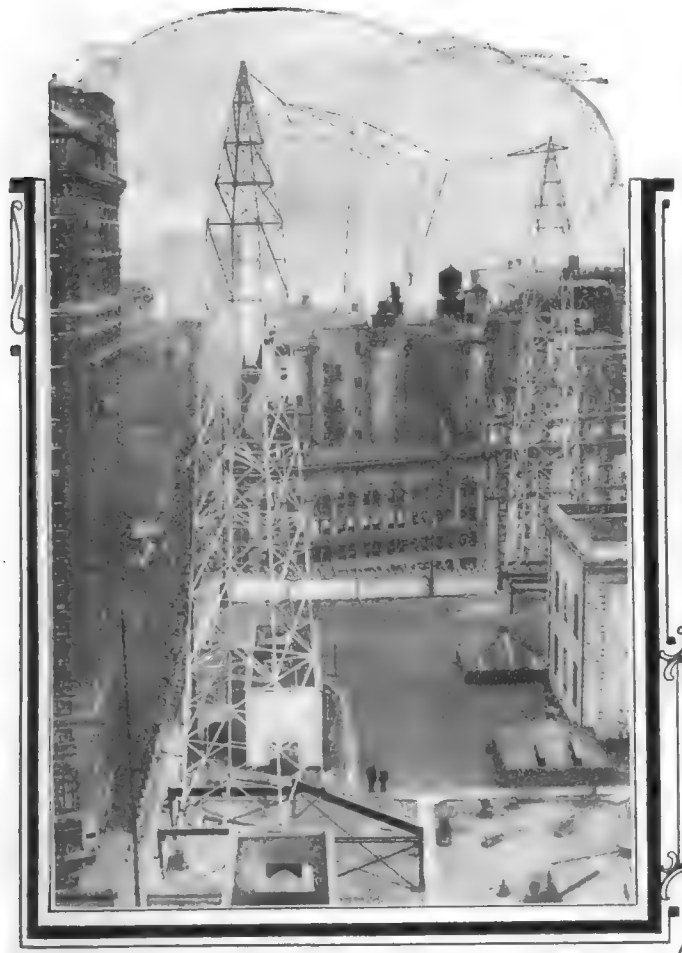
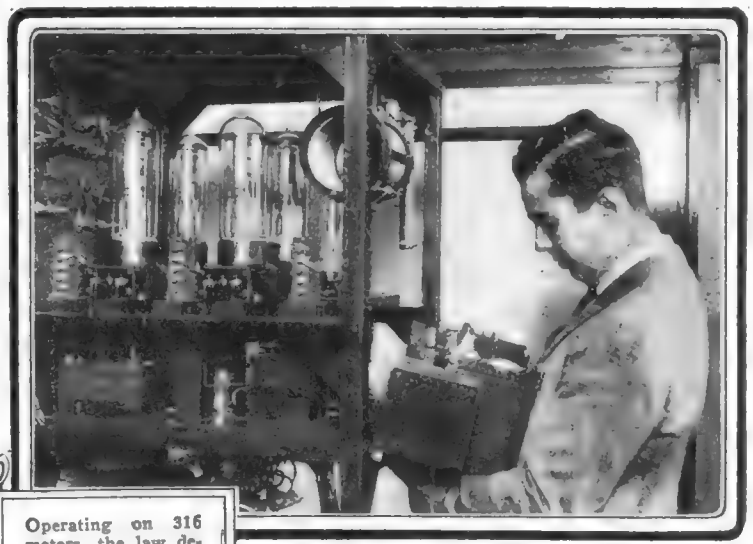
A New One--WGBS

Splendid Addition to New York's Broadcasters.

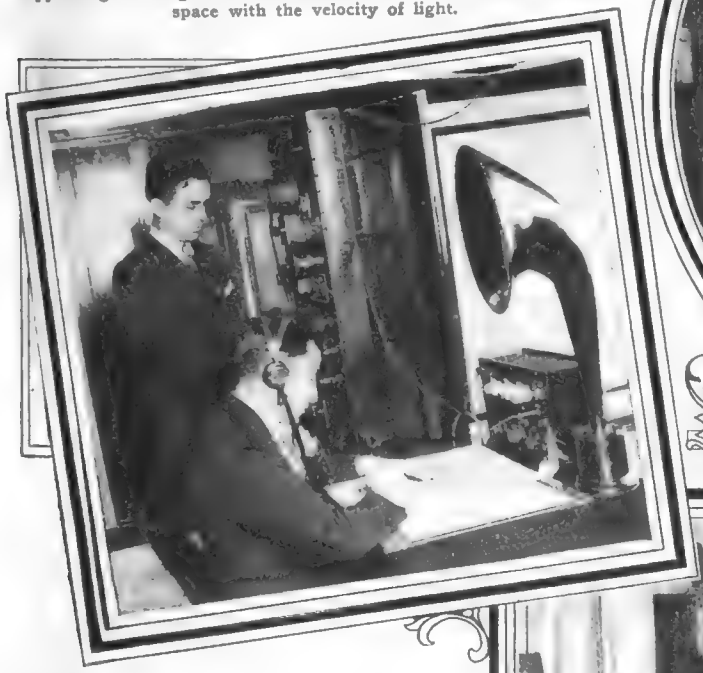


High up above the street resting upon the roof of the Gimbel Brothers' store in New York City are two beautiful antenna masts supporting the large aerial from which the programs pass through space with the velocity of light.



Operating on 316 meters, the law demands that no deviation from the allotted wave-length be allowed. The engineer checks up the wave-length daily.

The interior of the beautiful studio where opportunities are afforded those with an ambition to perform before the microphone. The entire studio is glass-enclosed.



WGBS is the second radio broadcast station to be operated by the Gimbel Bros' Co. The other is the well-known WIP located at Philadelphia. Above are shown the licensed radio operators who listen in continuously during the broadcasting of programs. To the right, is another corner of the artistically designed station. One of the many novel features is that the station is operated entirely by storage batteries, thus eliminating the annoying hum usually accompanying the use of generators. In this way clearer programs are the result.

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Trans-Atlantic Photo Radiograms

DETAILS OF HOW PHOTOS ARE NOW RADIOED BACK AND FORTH

By LEON L. ADELMAN

THE era of rapid transmission of pictures from country to country by means of radio is here. Across thousands of miles of space, hurdling oceans and continents alike, this agency we call Radio has been harnessed to carry the images of places and personages and happenings in one corner of the world to places and people in distant countries.

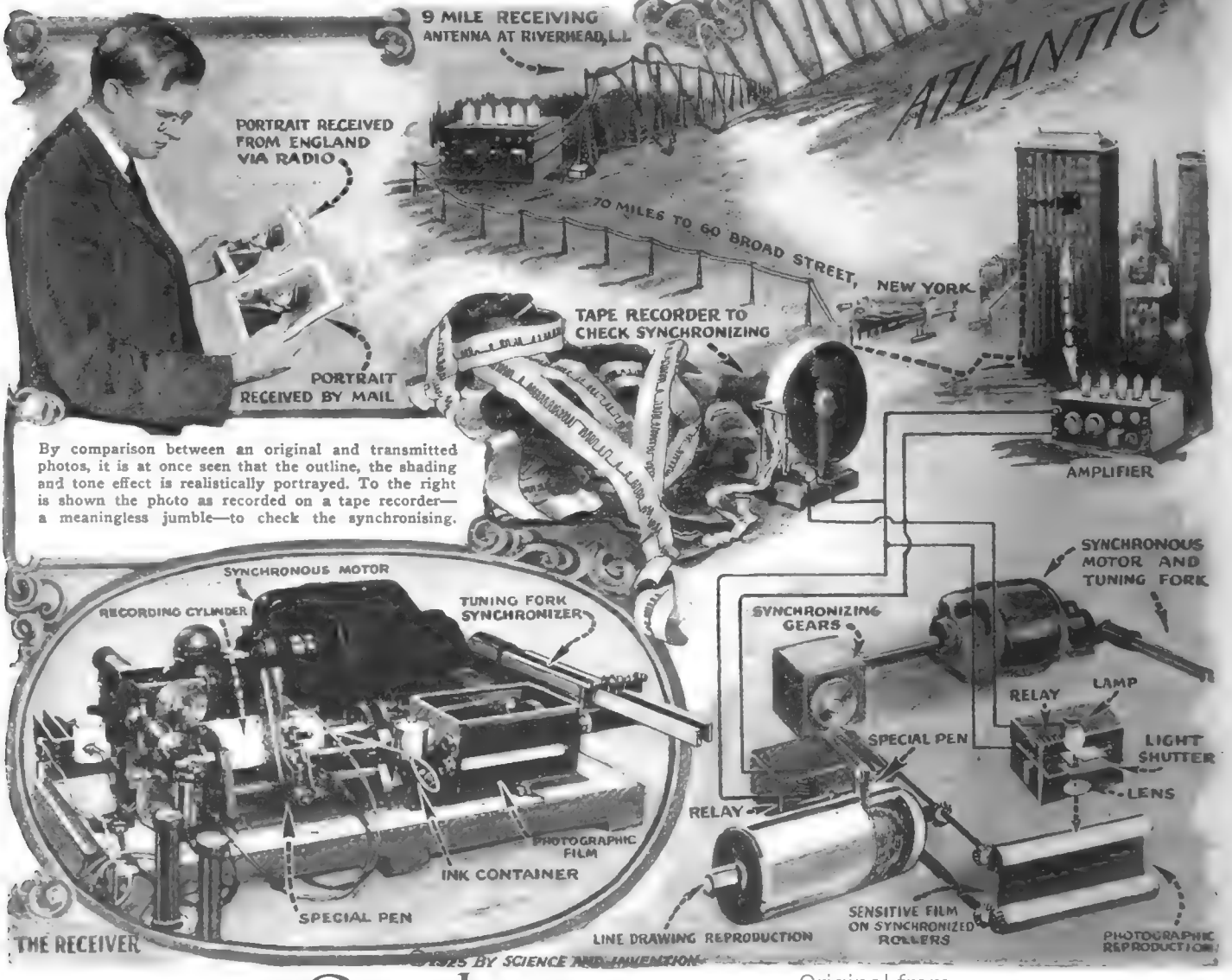
The full extent of this accomplishment cannot be foreseen at this time. But we believe it to be a great forward stride in radio science, and an important contribution toward "localizing" the news of the world.

As we study the forward marches of science, and their effect of steadily shrinking the world to what will ultimately become a single, big community of fellow humans, we must admit the growing necessity for the development of a universal language. Until this new process is worked out in its tedious way and accepted by the nations of the world, Photo-radiograms, which speak the truly universal language of pictures, will go far to bridge the gap that different latitudes and tongues have interposed between the peoples of this sphere on which we live.

There is an old Chinese proverb to the effect that "One picture is worth ten thousand words." This is as true today as the day it fell from the lips of the Chinese sage, for, since primitive man made his first crude drawing, pictures have been in constant use. So innate is our "picture sense," through centuries of cultivation, that one good picture may truly convey to us, at a glance, an idea or story that would require many words in the telling. It is not too much to suggest that the transmission of pictures across the world will play an important part in promoting world peace by making closer neighbors of peoples living on opposite sides of the earth. * * *—Statement by General James G. Harbord, President, Radio Corporation of America.

"Truly, a great achievement has been accomplished by the untiring efforts and perseverence of that small minority calling themselves Engineers and Scientists. One cannot begin to imagine against what great odds these promising results were obtained, but one can readily see that it was no small task to maintain absolute synchronism between apparatus 3000 miles apart."

Captain Richard H. Ranger, the developer of the system and the inventor of its unique features, is shown with the "electric eye," the tube which is responsible in a great measure for the successful operation of the apparatus. Not only photographs, but all kinds of printed matter such as newspapers, typewritten letters, and manuscripts are easily reproduced radioally.



By comparison between an original and transmitted photos, it is at once seen that the outline, the shading and tone effect is realistically portrayed. To the right is shown the photo as recorded on a tape recorder—a meaningless jumble—to check the synchronising.

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The "electric eye" shown at the top is a photo-electric cell whose electrical resistance varies in accordance with the amount of light falling upon it.

Ordinarily, the current delivered by the "electric-eye" would be a pulsating current of varying intensity and would ultimately result in a much inferior picture. Thus, a condenser "accumulator," another development by Captain Ranger, is interposed and breaks up the light variations into a series of dots and dashes. This system of modulation is found to be excellent, and in conjunction with the necessary transmitting apparatus gives a much more clearly defined reproduction. 400 volts D.C. is required for the successful operation of the photo-electric cell. Note transmitted photos at upper left.

Immediately above is shown the glass cylinder on which is placed the picture to be transmitted. Within is an incandescent lamp, the light from which is focused in a minute beam onto the film. As the light and dark portions of the picture are traversed by the light beam, the intensity of the ray is changed. This ever changing beam after having passed through the film is again focused through another lens outside the cylinder onto the sensitive element of the photo-electric cell. This device transforms the light waves into electric impulses or waves which can be transmitted by radio, much the same as a regular dot and dash message.

The receiving station where the apparatus is in absolute synchronism, records the photos in three ways, by tape, by pen sketch and photographically. Above: Complete outfit.

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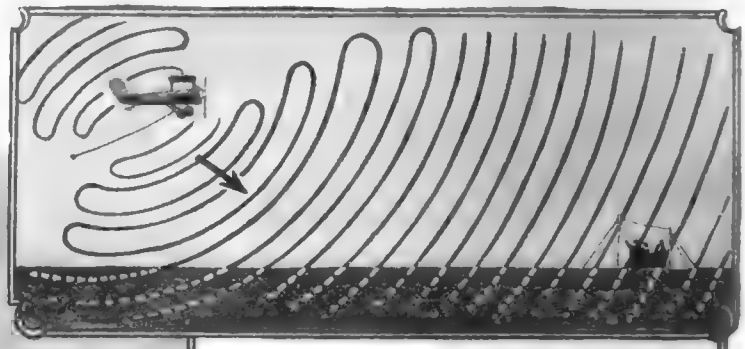
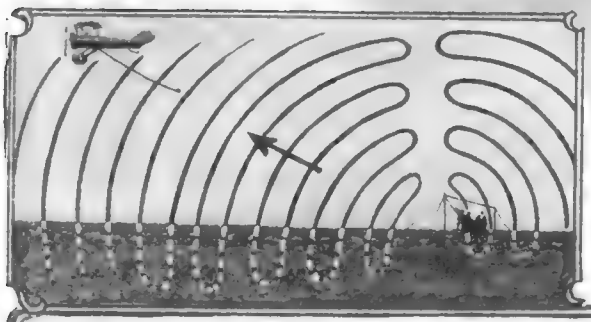
Broadcasting From the Clouds

Some New Developments by the Army



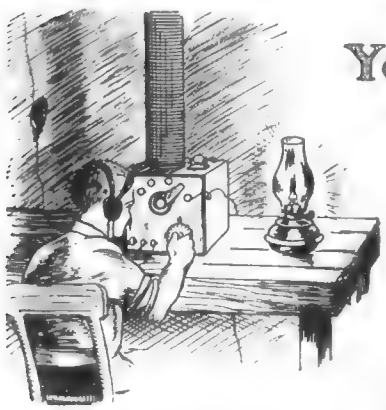
Advanced research work undertaken by the army's aviation officials shows great improvement in the transmission of radio messages from moving airplanes.



Quite recently it was demonstrated that the voice could be readily picked up by a receiving set on the ground, relayed over land line to the broadcast station from whence retransmission on a different wave-length took place. The army has been actively engaged in making thorough tests of the possibilities of radiophone communication between airplane mail carriers and the Post Office. At the present it has been found best to employ a single wire antenna of the trailing type as it was shown that the directional effects were desirable. Our artist has depicted the cross-section of the ether surrounding the transmission and receiving antennas, showing the electro-static field around them. The propagation of the waves show that they enter the earth's surface and as they attenuate, go further and further, until they become too weak to be amplified.

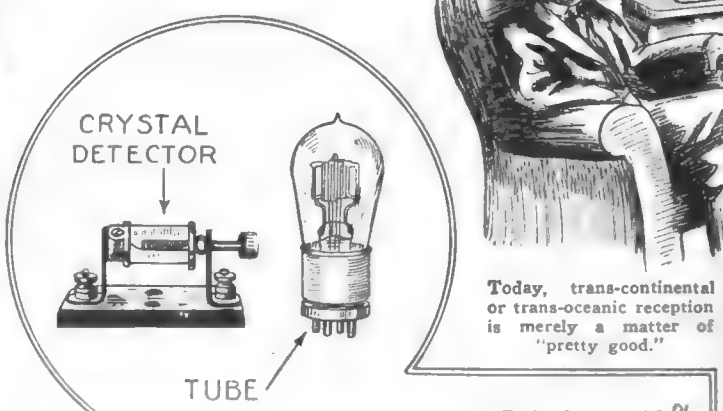
Capabilities of Your Receiving Set

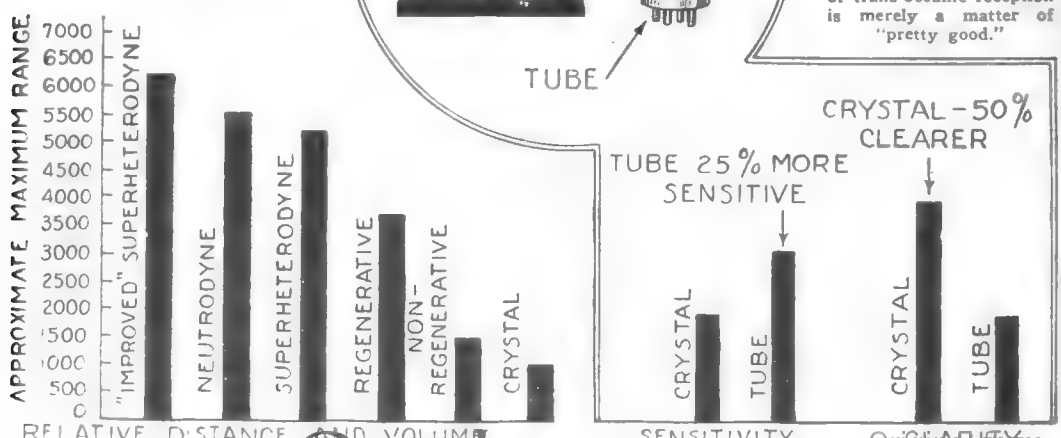
Which Do You Prefer—Distance, Volume or Clarity?



In the pioneer days of radio or wireless, as it was then called, a reception of a thousand or fifteen hundred miles was conceded a record.

Today, trans-continental or trans-oceanic reception is merely a matter of "pretty good."





Whether you as the owner of a receiving set and are proud of its performance, whether you are interested in knowing or not knowing about the intricacies of the circuit it employs, we are sure that the information contained graphically on this page will prove of more than passing interest to you. Radio, even at its present stage of development, has still many problems to be solved. Our tubes, although 25% more sensitive than the still popular crystal, are but 50% as clear. Our receiving sets with their multiplicity of dials and the complication therein arising when tuning in stations, will, in the course of a few years, be decidedly changed. Whether you are the owner of a crystal set or 17 tube set, you should be getting results comparable with this chart.

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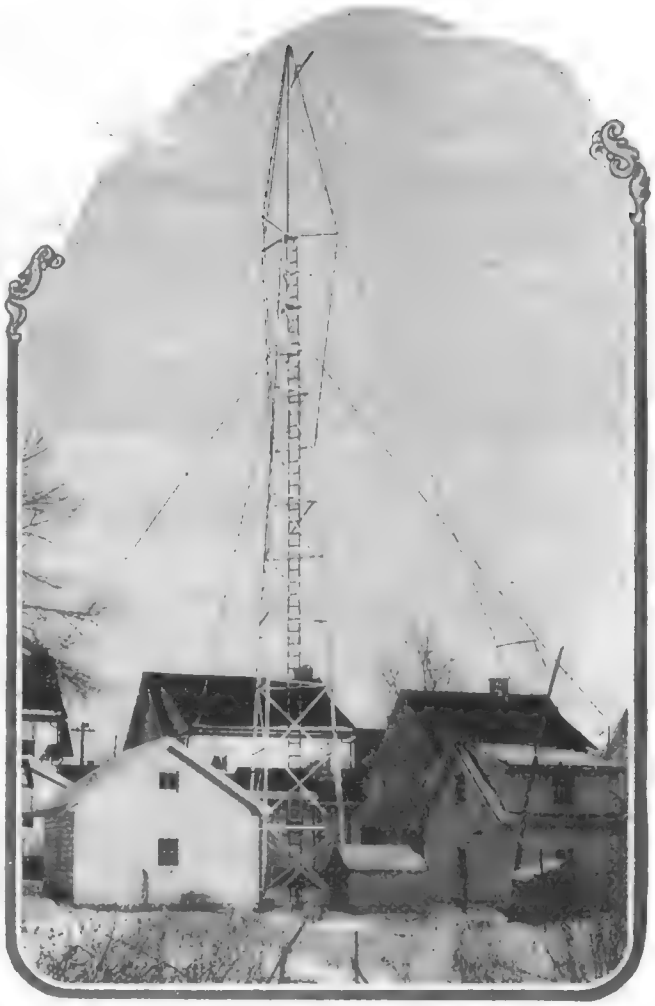
100 Ft. Antenna Mast

By FRED A. PARSONS, 2ABM

Constructional Details Which Will Enable One To Build Something Useful and Distinctive

HOW would you like to have a beautiful and artistically constructed antenna mast, gracefully reposing in your back yard? Of course you would, if the structure didn't entail too much labor, cost, space and trouble. This substantial mast is a creation you will always be proud of, a landmark which will attract wide attention and as an observation tower really worthwhile the time and trouble to build. Although provided with three mainstay guys, as a measure of safety, the tower has weathered several high gales with the guys cast off, without the semblance of a perceptible sway at the top. It is interesting to note that though entirely made of wood, the structure is as safe as a steel structure of the same type. It has been estimated that the static load on each leg is in the neighborhood of 400 pounds, or, fifty pounds per square inch of cross-section, a fraction of the compression limit of the wood used.

The foundation is the most important consideration and no trouble was too large to overcome, in accomplishing the desired result. For each leg of the tower, a hole six feet deep, three feet long and one foot wide was dug. A large steel plate to which was securely bolted two iron rods, was first put in. One ton of large stones was then thrown in on top and finally, after having placed the first sections of the legs in place, three-quarters of a ton of concrete were cast around them.



This veritable giant of colossal proportions can be seen for miles around.

LIST OF MATERIALS

LUMBER

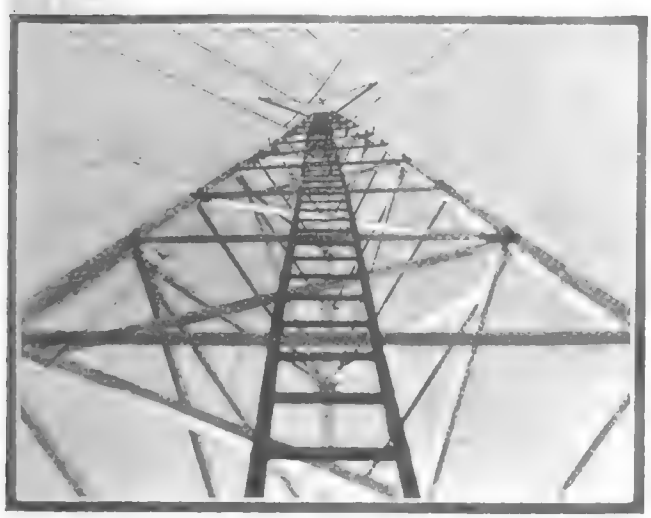
2 x 4 Legs—240 feet.
2 x 3 Bracing—900 feet.
1 x 4 Flanges for Legs—150 feet.
1 x 2 Steps for Ladder—100 feet.
3 x 4 Mast (1 piece)—31 feet.

FITTINGS

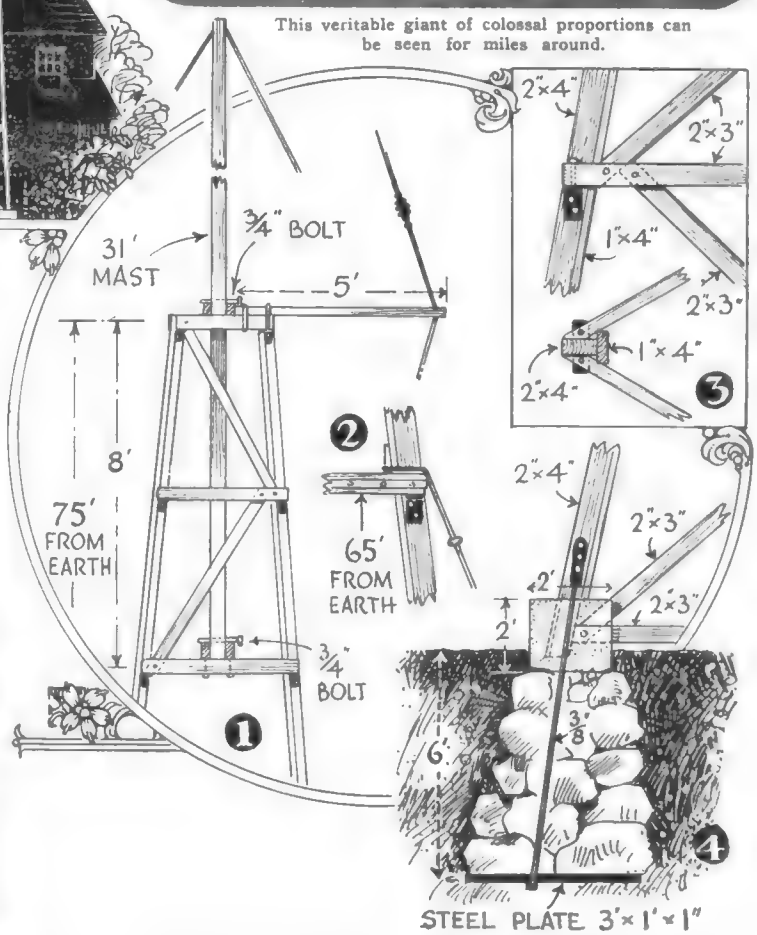
262 bolts and necessary washers.
82 galvanized brackets.
3 special angles, ⅛" x 2" x 2"—for guy wires.
300 feet ⅜" galvanized steel guy wire.
200 feet ¼" galvanized steel guy wire.
52 galvanized guy wire clips.
12 large porcelain strain insulators.
3 ½" galvanized turnbuckles.
3 ⅜" galvanized turnbuckles.

FOUNDATION

1½ tons of concrete.
3 tons of stone.
3 steel plates, 1' x 3' x 1".



Looking upward before taking the dare to climb up to lofty heights. The ladder is perfectly safe, the rungs being sunk flush with the ladder legs and held to the structure by bolts fastened securely at frequent intervals. Note carefully the diagonal and horizontal bracing, each piece being rigidly bolted to the main framework so as to insure against longitudinal and lateral play.



The first horizontal brace is placed at a height of seven feet, and the rest graduate down so that at the top, the uppermost two are but four feet apart. The three main guy wires are attached at a height of sixty-five feet. The antenna mast is also guyed by three out-riggers, each five feet long and bolted as shown in the sketch. Two king pins allow the lowering of the topmast for antenna repairs. The legs are 12 feet apart at the foundation.

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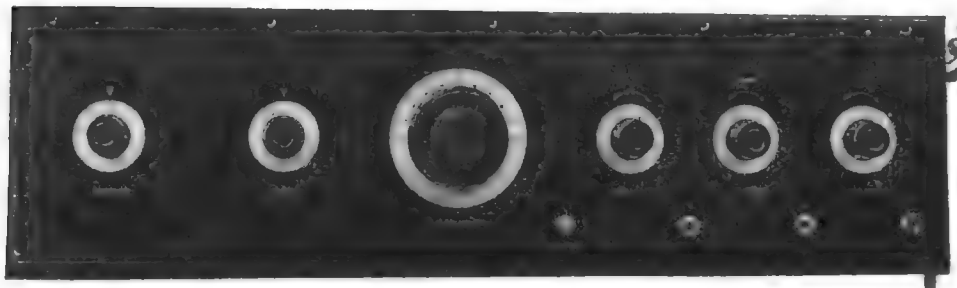
A Low Loss Broadcast Receiver

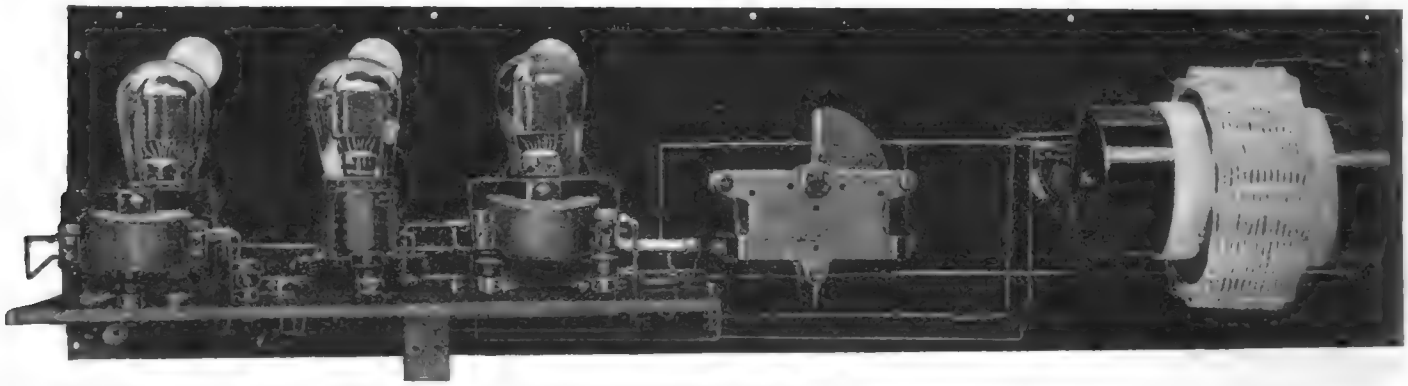
Refinements Which Bring in the "DX"

By FRANK FRIMERMAN, 2FZ



THE ideal three tube broadcast receiver should be easy to construct, should contain a minimum of apparatus, and should incorporate only materials of well known manufacture. Above all, its cost should be low, its operation should be simple and its prowess something to boast about. Now that the low loss idea has been brought to the fore—and indeed it is a step in the right direction—the very latest and endorsed principles of radio engineering have been made inherent in the construction of this broadcast masterpiece. With but one tuning control operating on a vernier dial, the set is truly an achievement worth while duplicating.

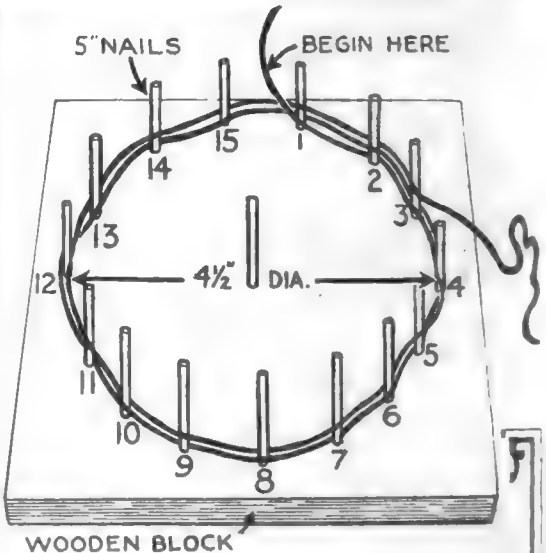
What is this low loss idea? Why have the majority of radio fans been so intensely interested lately in carrying out the low loss idea? The employment of low loss parts stipulates that all tuning inductances shall have a minimum of losses due to distributed capacity, insulation leakage and stray capacity effects. Nor are condensers, sockets, jacks and transformers immune from the primary consideration of perfect insulation, perfect contacts, and accurate mechanical and electrical design which has greatly enhanced the progress of radio during the last few years.

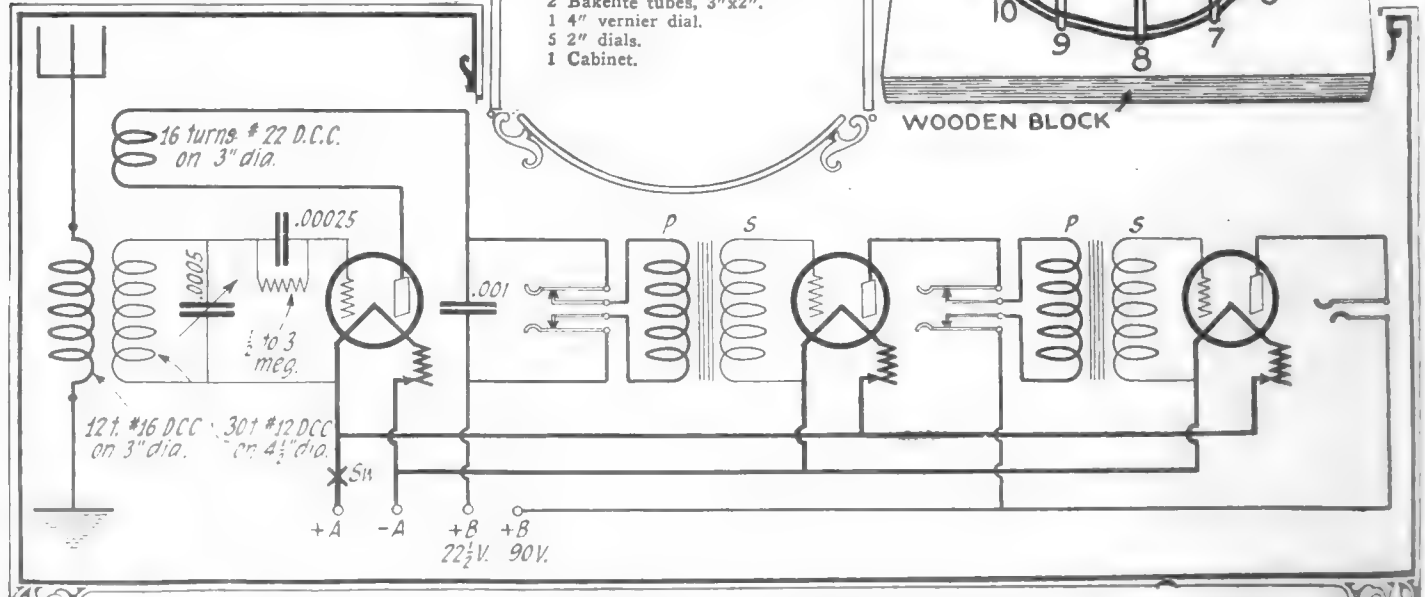


The most important parts are the tuning inductance and variable condenser. Of these, the condenser must be purchased. However, the inductance can readily be made by the enthusiastic fan with little trouble. One method of winding the coil is by first driving an odd number of nails—in this case fifteen—into a wooden block about six inches square. The diameter of the coil is 4½" and when completed contains 30 turns of No. 12 D. C. C. wire. The winding consists of leading or interlacing the wire between alternate nails on the form, remembering to wind the wire tightly. When the coil is finished, a piece of ordinary string is entwined between the windings, so as to hold them together—in other words, making the coil self-supporting. The primary consists of 12 turns of No. 16 D. C. C. wound on a bakelite tube 3 inches in diameter and 2 inches long. Upon a similar tube, 16 turns of No. 22 D. C. C. is wound, comprising the tickler. The secondary winding may be supported by two thin strips of bakelite, fastened to the panel in the conventional manner.

List of Parts

1 Bakelite panel, 7"x24".
1 Sub panel 10"x6".
1 23-plate low loss condenser.
3 6-ohm rheostats.
3 Good sockets.
2 4 to 1 audio transformers.
2 Double circuit jacks.
1 Single circuit jack.
1 Filament switch.
1 .00025 grid condenser.
1 .001 by-pass condenser.
½ lb. No. 16 D. C. C. wire.
½ lb. No. 22 D. C. C. wire.
1 lb. No. 12 D. C. C. wire.
1 Grid leak, ¼ to 3 megohms.
6 Binding posts.
2 Bakelite tubes, 3"x2".
1 4" vernier dial.
5 2" dials.
1 Cabinet.





The regenerative circuit in all its glory, elevated to a higher plane by the introduction of low loss parts, still proves that it is the old stand-by, taking its place among the foremost receivers in the world.

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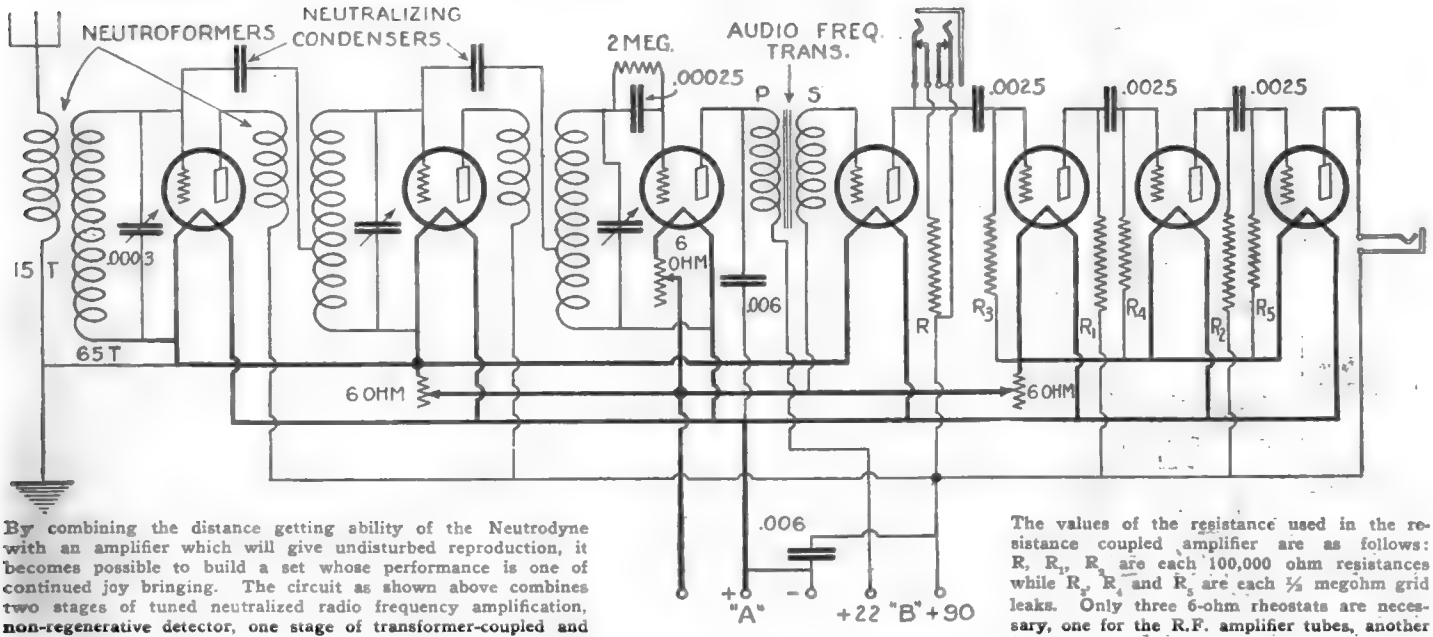
Three Extra Good Circuits

A Seven Tube Neutrodyne Par Excellence.

By E. E. LAUFER, 2AQP

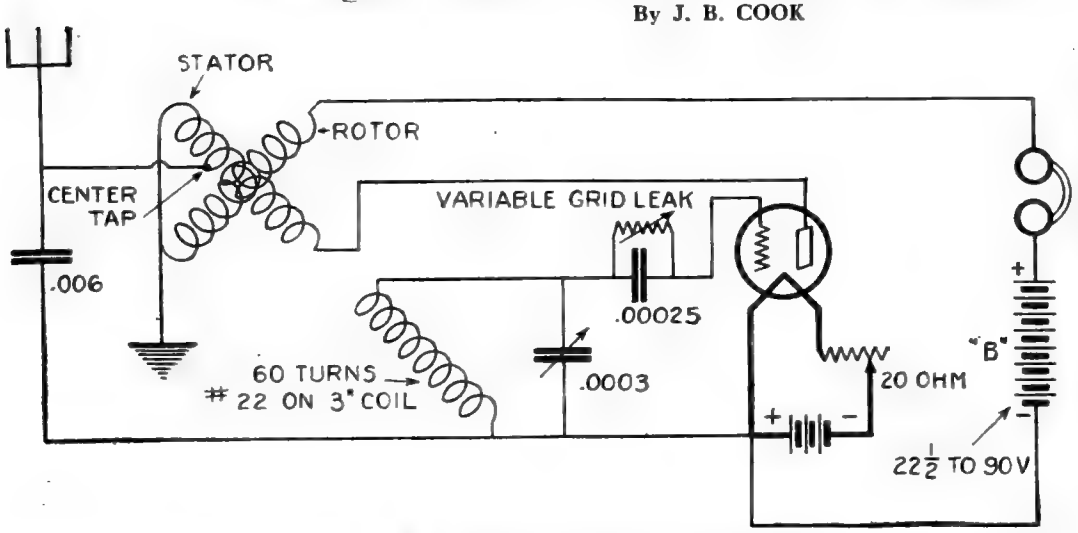


By combining the distance getting ability of the Neutrodyne with an amplifier which will give undisturbed reproduction, it becomes possible to build a set whose performance is one of continued joy bringing. The circuit as shown above combines two stages of tuned neutralized radio frequency amplification, non-regenerative detector, one stage of transformer-coupled and three stages of resistance-coupled audio frequency amplification.

The values of the resistance used in the resistance coupled amplifier are as follows: R, R_1, R_3 are each 100,000 ohm resistances while R_2, R_4 and R_5 are each ½ megohm grid leaks. Only three 6-ohm rheostats are necessary, one for the R.F. amplifier tubes, another for the detector and a third for the A.F. amplifier.

A Superior One Tube Regenerator

By J. B. COOK

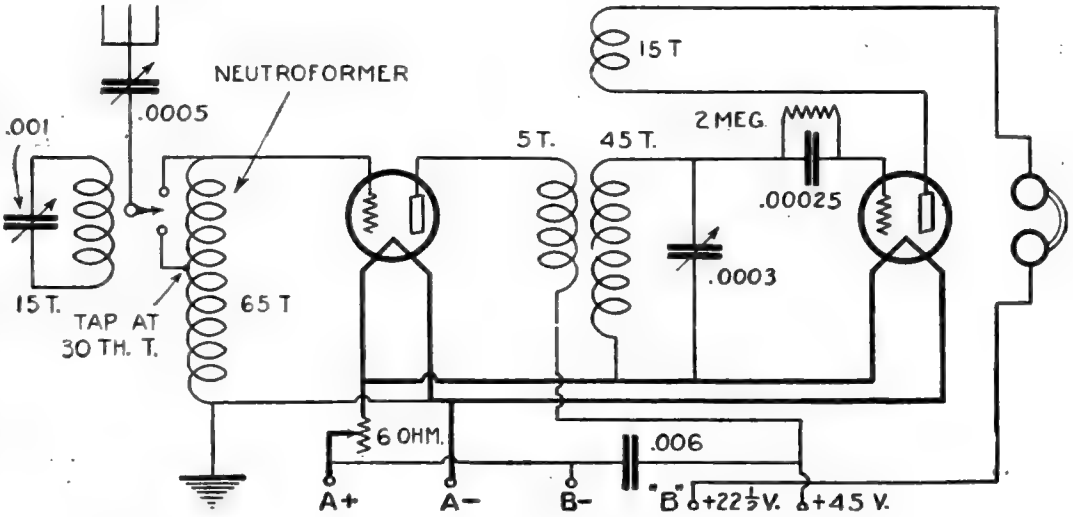


A single tube circuit which will very successfully operate a loud speaker on all local stations is shown in the diagram on the left. It is necessary to place a coil containing 60 turns of No. 22 D.C.C. wire in inductive relation to an ordinary variometer whose stator has a center tap taken off. By varying the "B" battery potential anywhere from 22½ to 90 volts, it becomes possible to bring in the stations with maximum volume. In fact, it is possible to receive them with the "B" battery entirely disconnected from the circuit. For best results a variable grid leak is necessary, as well as a 20-ohm rheostat. It will be noted that the circuit has both inductive and capacitative feed-back, well nigh approaching the super-regenerative circuit and much easier to control. A dry cell tube can readily be used.

A Special "DX" Circuit

By MATTHIAS THURY, 2CT

Combining the advantages of one stage of radio frequency amplification with a regenerative detector, and utilizing the primary of the neutroformer in conjunction with a variable condenser as a wave-trap, it is possible to build a two tube set which, although not a bug-bear for volume, will bring in the distant stations without fail. A standard neutroformer is used for the R.F. amplifier, while an ordinary variocoupler rewound to conform with the specifications given in the diagram serves its purpose well. Besides being absolutely free from undesirable radiating properties, the set is provided with a two contact switch which allows selectivity to be obtained as well as affording a reasonable change in wave-length adjustment. Though the set has a number of controls, from the standpoint of experimental design, it is really worth while building. One 6-ohm rheostat will be found to control the filaments of both tubes nicely. 201A tubes are to be recommended.



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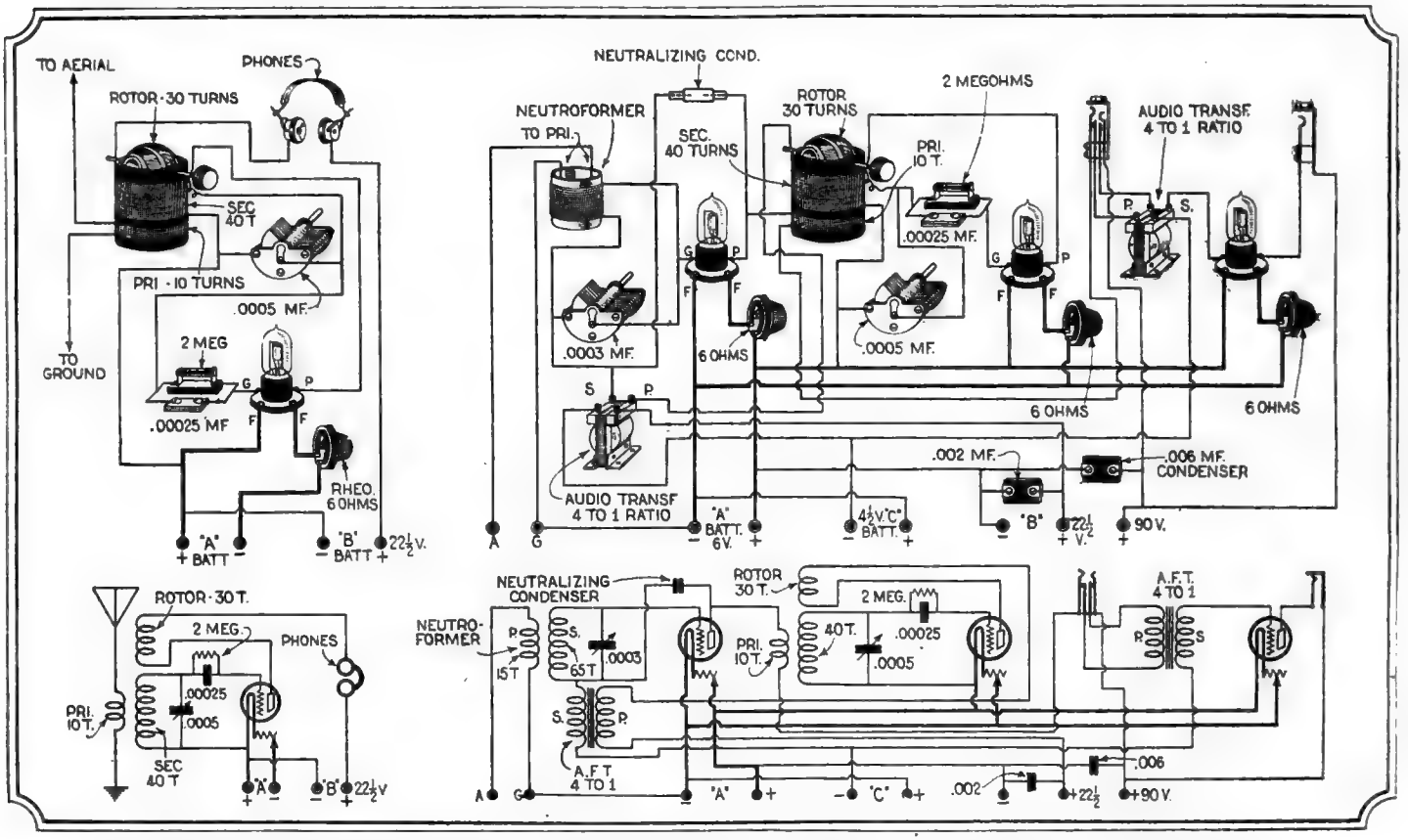
Radio Oracle

In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this Department cannot be answered free. A charge of 25c. is made for all questions where a personal answer is desired.



The beginner's set is rapidly being improved by the addition of more tubes. If you want good results you should try this circuit.

IMPROVEMENTS

(329) Milton Stanley, Syracuse, New York, asks:

Q. 1. What is the best circuit to use in rewiring my single tube regenerative set into a three tube receiver?

A. 1. Instead of merely adding two stages of audio frequency amplification, the above circuit employing one stage of tuned R. F., regenerative detector, one reflexed and one straight audio frequency stages of amplification will be found to give excellent results.

RADIO PHOTOGRAPHY

(330) J. H. Merwin, San Jose, Calif., asks:

Q. 1. Kindly give a brief resumé of the experimentation in radio photography since its inception of the transmission of photos by telegraphy and radio?

A. 1. With the present great strides in the transmission of photos by telegraphy and radio, and the announcement by Col. Green of the transmission of moving pictures by radio over a distance of nearly a hundred feet, it will not be surprising if in the very near future we will be sitting in our homes and listening to what the world has to say besides seeing the greatest opera performances that it has to offer.

As early as 1856, Caselli sent various designs by telegraphy using for the transmitter a tin foil-covered cylinder on which the designs were drawn in insulating compound. A needle acting very much like the stylus of a talking machine needle served the purpose of a contact pin, traveling over the surface of the revolving cylinder. Thus the circuit was made and broken as the lines passed under the contact pin, while at the receiving end, by an electro-chemical action, a cylinder which was exactly synchronized with the transmitter, reproduced the designs directly. The discovery of the effect of light on the electrical resistance of selenium became known in 1873 and shortly afterwards various schemes to substitute selenium for Caselli's process were tendered. The most noteworthy were those of Semlocq and Perosino in 1878. After quite a long time, Korn in 1904, employing Semlocq's plan with several modifications, put it into use and transmitted photographs several hundred miles from their destination. A negative of the picture was wound on a glass cylinder and a very narrow beam of light was used as a stylus passing through it. By reflection to a single selenium cell whose resistance varied according to the amount of light passing through the negative, the input current was modulated into the transmitting circuit. In the receiving station the current was passed through an evacuated tube which grew brighter or darker according to the pulsating incoming current. These variations in light were focused onto another cylinder covered with sensitized paper and of course after developing, reproduced the original picture in its entirety. By further experimentation, Korn was able to improve slightly on his apparatus and in 1907 made several photographic transmissions from Paris to London.

Perhaps the most original scheme was that developed by Edouard Belin. His scheme resolved itself upon the fact of his discovery that bichromated gelatin becomes insoluble under strong light. Thus he wets a film of this gelatin and places it under the negative he exposes, whereupon the portions of the gelatin exposed to light swell up more or less in proportion to the intensity of exposure, while the protected parts remain flat. This forms a sort of relief map of the negative and is wound on a cylinder over which a stylus traces its path. A microphone is attached to this stylus and by its rising and falling, the resistance of the microphone is varied which in turn controls the intensity of the current passing through it. At the receiving station an oscillograph has its mirror deflected in proportion to the current received and a light beam is reflected thereby to another cylinder. This cylinder has a sensitized paper on it and thus, providing the receiving and sending stations are in exact synchronism, the picture will be reproduced faithfully. The hardest part of the transmission of photographs lies in the synchronizing methods employed.

More recent work has been done by Jenkins, Nakken, Col. Green and others who believe that the transmission of moving pictures by radio will shortly become an accomplished fact.

WANTED!!! RADIO ARTICLES

WE want descriptions of new radio ideas which you have worked out in practice. Take photographs of the important parts and make pencil or pen and ink sketches of the hook-ups or mechanical details, et cetera. We are particularly desirous of obtaining new hook-ups and descriptions of single tube sets, reflex and other types which have proven satifactory. We like articles on new single tube receptors. We will pay good prices for your ideas. —Editor.

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BUZZER OSCILLATOR

(331) John Ballinger, Fort Worth, Texas, says he has recently completed a Neutrodyne sets and asks:

Q. 1. I am in need of a buzzer oscillator in order to help me neutralize the set. I would, therefore, appreciate it very much, if you give me complete details as to its construction.

A. 1. The buzzer oscillator often finds other uses than that for the purpose of aiding in neutralizing a set. It can be used very successfully as a wavemeter if carefully calibrated, and will afford many other uses. On a cardboard or bakelite tube, three inches in diameter and three and one-half inches long is wound 70 turns of No. 22 D.C.C. wire. Connected across this coil is a 15 plate variable condenser, having a capacity of .0003 mf. This arrangement will tune approximately from 200 to 600 meters. An ordinary dry cell buzzer is conected in the circuit in series with a key or switch and the buzzer-driven oscillator is then complete. As shown in the diagram, only one connection is run to the receiving set, and that is placed on the antenna post. If neutralization is desired on the shorter waves, the condenser is turned until its rotary plates are nearly all the way out and the usual method in neutralizing the set is followed. A good way to calibrate your oscillator is to place its coil near the first neutroformer of the set while listening in. Tune in a local station whose wave-length you are assured of. Then, by slowly moving the variable condenser of the oscillator until the station has completely faded out, note the reading on the dial on the oscillator. Then tune in another station on a different wave-length and again set the oscillator until the station has completely disappeared.

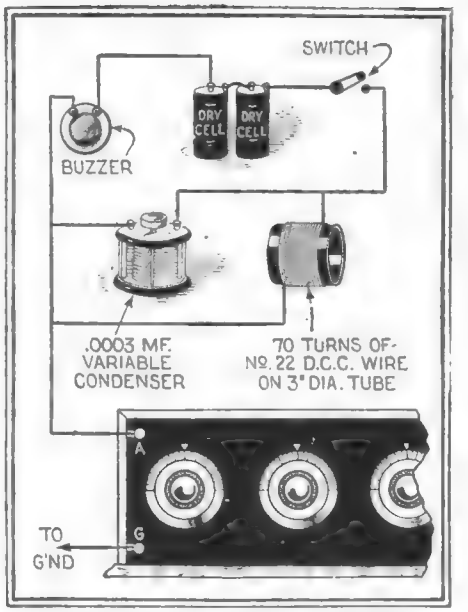
Thus a series of points are plotted and a very accurate graph is consummated which will come in very handy. As can readily be seen, the device lends itself very effectively to use as a wave-trap.

SHORT WAVES

(332) Charles Reiser, Asheville, N. C., asks:

Q. 1. Can you please state whether it has been actually found that the short waves are superior to the longer ones?

A. 1. When Marconi first placed wireless transmisson on a practical basis, many years ago, he propounded the theory that the long waves were the best and showed why he believed it. It has been some time since Marconi's first experiments and gradually the radio fraternity is coming to the realization that the short waves are much superior to the longer ones. One reason for this is the great proportional difference in frequency range on the shorter waves between a given number of meters. Thus, between 90 and 100 meters, there is a difference of nearly 340,000 cycles, whereas for the same number of meters difference, between 400 and 410 meters, the difference is but 18,000 cycles. It can be seen at once that there is nearly 20 times the difference in frequency between this given wave-length range on short waves than for this given range on longer waves. Thus the tuning is unusually sharp as we approach the lower waves and unless apparatus of low loss and careful design is employed, their reception is very limited. Again, signal strength seems much more intense and the degree of clarity becomes more distinct. Since tuning is so extremely sharp, interference is practically unknown, although occasionally, it is possible to pick up a harmonic from a powerful long wave transmitting station. Due to the great chances for leakage at these high frequencies, special care must be taken in the use of the various insulating materials to be employed. Large sized wire should be used in the tuning coils, No. 16 seeming to be very efficient for the shorter wave.



Buzzer oscillator for use in adjusting neutrodyne.

What Is It?
$20.00 Prize

By HUGO GERNSBACK

HERE is a puzzle that may well tax your ingenuity. SCIENCE & INVENTION offers $20.00 for the best solution of the puzzle. This puzzle will be known as the *"Five Sense Mystery"*. The subject under consideration is an inanimate thing—meaning that it is not living.

You can taste it;
you can smell it;
you can hear it;
you can see it and,
you can feel it,—

in other words you use all of your five senses. Yet, and most important, *you must never touch the particular thing.*

Although this may seem impossible, it not only can be readily done, but you probably have done it many times yourself.

The particular thing is found in almost every household. It is *not*, for instance the wind, the ocean, etc.

There will be one prize of $20.00 for the best answer to the correct solution. The prize will go to the person who not only gives the correct solution, but gives the solution in the shortest amount of space in the simplest language.

Should two contestants submit the same answer, the same prize will go to both. This contest closes Feb. 15, 1925.

Address all replies to Editor, *Five Sense Mystery*, c/o this Publication, 53 Park Place, N. Y. C.

INTER-ELECTRODE CAPACITIES

(333) Jonas Kaufmann, Syracuse, New York, asks:

Q. 1. Will you kindly tell me the frequency limits and the inter-electrode capacities of the 201A tube?

A. 1. Due to the very nature of the questions you ask, we have referred your letter to the Director of the Research Department of the General Electric Co., Dr. W. R. Whitney, who writes as follows:

"As far as the tube itself is concerned, there is no lower frequency limit. The tube will amplify any frequency no matter how low and the lower limit at which it can be made to oscillate depends entirely upon the capacity, inductance and resistance of the circuit.

"As regards the high frequency limit, this is determined by the capacity between the tube elements and the length of wire in the tube and outside wires connecting these elements. These wires, no matter how short, have a certain inductance and this in combination with the capacity of the tube gives a certain natural electrical period, which represents the highest fundamental frequency that can be obtained from the tube oscillating in the usual manner. In the small standard Radiotron tubes available at the present time, it is probable that this limit is somewhere in the neighborhood of two or three meters. Utilization of harmonics, however, may allow this figure to be exceeded. These limitations, of course, apply only to the use of the tube in the usual forms of oscillating circuits employed in radio work. Some interesting experiments on very high frequency oscillations from tubes in which the ordinary types of circuits are not used have been described in the following references.

"Die kürzester, mit Vakrumrohren herstellbaren Wellen."
H. Barkhausen & K. Kurz,
Physihalische Zeitschrift,
January, 1920—Page 1.

"A Singular Case of Electron Tube Oscillations."
G. Breit,
Journal of the Franklin Institute,
March, 1924.

The inter-electrode capacities of the UV-201A average about the following values:

	Grid-Filament	Plate-Filament	Plate-Grid
UV-201A—	6.0 mmf.	6.0 mmf.	7.5 mmf.

These values are not arrived at mathematically but by actual measurement. There is little need or reason to calculate these values and they are obtained entirely by measurement."

DeForest and Fessenden—Read Their Biographies

In the October issue of *Radio News*, there started a biography of Dr. Lee DeForest, inventor of the Audion. This biography will run for 12 months in *Radio News* and we hope all SCIENCE AND INVENTION readers will read this important work by the famous inventor. Prof. Reginald A. Fessenden's biography started, in the January number.

LIST OF ARTICLES TO APPEAR IN THE FEBRUARY ISSUE OF RADIO NEWS

Curing Cancer with Ultra Radio Frequencies By George Lakhovsky

The Radio-Photo Letter By S. R. Winters

The Inventions of Reginald A. Fessenden

Amplifying Short Wave-Lengths with Resistance Coupled Amplifiers By Pierro Lafond

Multi-Stage Radio Frequency Amplification—Part IV By John Scott-Taggart F. Inst. F., A.M., I.E.E.

Fundamental Transmission and Reception By E. H. Hansen

Experiments with Five Meters—Part II By William A. Bruno

Regeneration and the Patent Situation By John B. Brady, Patent Lawyer

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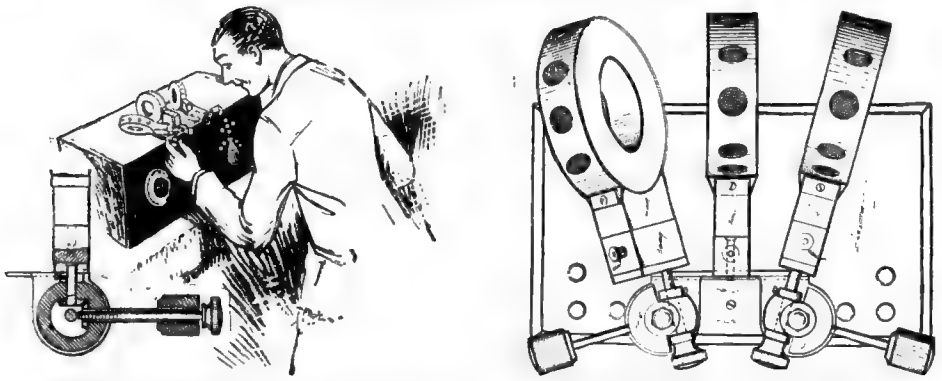
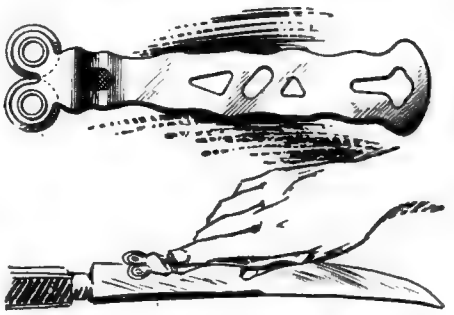
LATEST PATENTS

Honeycomb Coil Mounting



No 1,510,859, issued to L. G. Pacent relates to a new and interesting method of mounting honeycomb coils so that they may be used in a radio circuit. The illustrations above show the details of the coil mountings and also how the entire unit is to be mounted on the top of a radio set cabinet. With this new type of mounting, it is possible to turn either of the two movable coils so that they are in a different plane from the center stationary coil. A locking arrangement is also provided.

Knife Sharpener



No. 1,509,136, issued to Milton G. Goff describes an improved knife sharpener as illustrated above. The sharpener is drawn along the blade of the knife several times until the desired edge is produced.

Golf Accessory

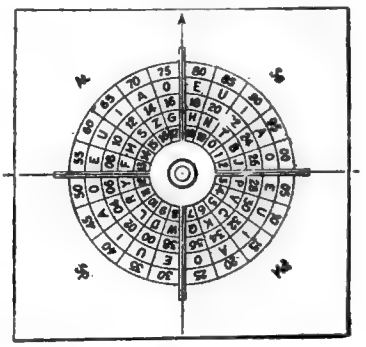
No. 1,509,302, issued to N. A. Larssen. In the game of golf, it is quite necessary that in order to make the best shots, the ball be placed on a suitable mound, known as a tee. The invention illustrated above, is for the purpose of forming these tees. Damp sand is compressed in the base of the device and then released as shown above. A perfect tee results.

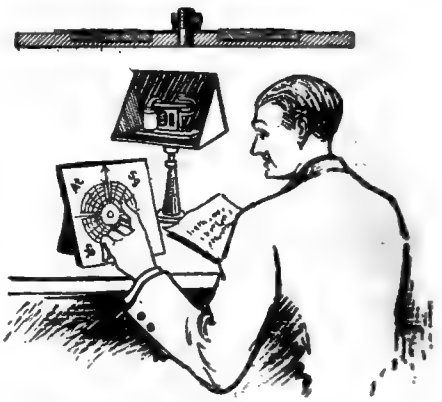
WANTED

ARTICLES pertaining to automobiles such as handy kinks, roadside repairs and anything of interest to the man who drives a car. $50.00 in prizes every month are offered by MOTOR CAMPER AND TOURIST for such articles. Get a copy at your newsstand and see what is wanted. If your newsdealer cannot supply you send for free sample copy to:

MOTOR CAMPER & TOURIST
53 Park Place,
New York City.

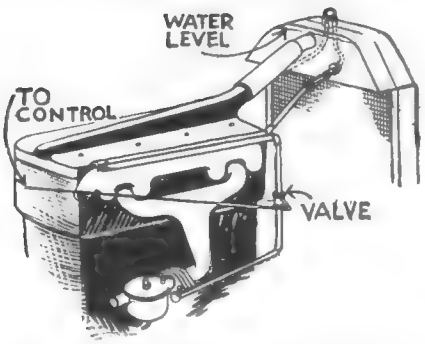
Code Device





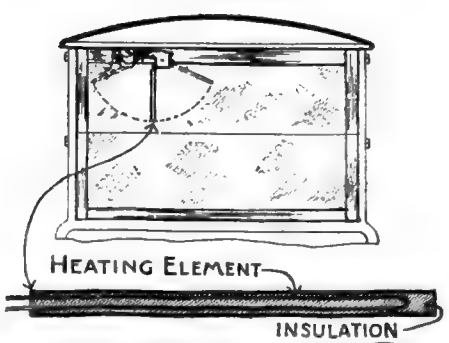
No. 1,509,929, issued to A. C. Caballero. A device for quickly and easily making up and decoding cryptographic messages. Circular in form, the device is readily manipulated.

Gas Saver



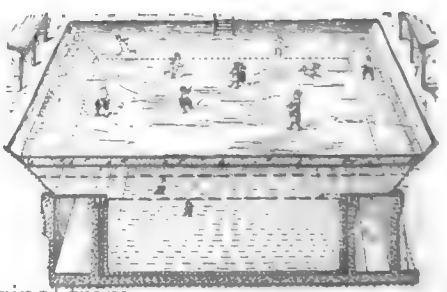
No. 1,510,151, issued to L. C. Moore describes a device for introducing moist, warm air into the intake manifold of a gasoline engine. This air is drawn from above the water level in the radiator.

Cleaner



No. 1,510,015, issued to C. L. Rayfield. Although the device illustrated at the left appears to be an ordinary windshield cleaner, it differs therefrom in that it contains a heating unit in the cleaner to assist in removing snow from the windshield.

Swimming Pool



This new patent relates to the protection of ceramic swimming pools during the winter. A larger pool is formed around and above the ceramic one, the banks being of sod. In cold weather, the pool is filled to several feet above the ceramic walls. Ice forms on the top, but the water cannot freeze as low as the ceramic surface. This pool may be used as a skating rink in winter as shown at the right.

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Scientific Humor

HASN'T HYDROGEN HY DENSITY?

The class in college chemistry had been studying hydrogen. In the examination the question was asked, "What substance has the lowest density that you are acquainted with?"

One paper read, "Water is the least dense substance that I am acquainted with; alcohol and ether are lighter, but I am not acquainted with these."—*Harry R. Lubcke.*

HE GOT HIS PHYSIQUES FROM THE POLICE GAZETTE

PHYSICS PROFESSOR: "Can anyone tell me the principles of the diving bell and for what purposes they are used?"

STUDENT: "Yes — Diving Belles are mostly used to get people to buy magazines and most of 'em ain't got any principles."—*Noel Compton.*

CALL FOR STATION KAT

LITTLE GIRL TO BROTHER: "Jimmy, what makes that whistle in our radio set?"

BROTHER, looking puzzled: "'Dunno. I heard Pop say he put up a 'cage' antenna, and mebbe a bird got caught in it."—*Harry Walters.*

OR AN INTERFERENCE ELIMINATOR

SHE: "What invention would mostly revolutionize kissing?"

HE: "An asbestos protector for moustaches."—*M. W. Harp,* Reporter No. 13,578.

THIS IS RELATIVELY IMPORTANT

FIRST SCIENTIST (viewing monkey in cage): "It is apparent to me——"

SECOND SCIENTIST: "Ah! Really, I did not know you claimed so close a relationship."—*Prospero Astrella.*

WE BET THE WATER TANK BURNED

CANADIAN: "I certainly do admire Uncle Sam's prohibition officers."

YANK: "Why?"

CANADIAN: — "Well, I cleaned my variable condenser with alcohol and I couldn't get any stations in U. S. A. until it evaporated."

—*Moe H. Friedman,* Reporter No. 4880.

THAT'S THE DOPE

FRIEND: "What a horrible noise comes from your radio set!"

RADIO FAN: "Well, I guess you would make just as bad a noise if you were coming out of the ether."—*Samuel Theodore Katz.*

WOULD THE CO HEAR HER?

MR. EDITOR: "Can you tell a phone from a wireless set?"—*J. C. Mello.*

HOW ABOUT THE NIGHT RATE?

BILL: "I missed my date because of a chemical."

WILL: "What do you mean?"

BILL: "I didn't get the nitrite."—*A. Daansen.*

First Prize $3.00

METHUSELA USED AN ARC!

MRS. OLDEHAM: "Thank you so much for the wonderful birthday cake, dear, but tell me, what is the idea of the electric light bulb on it?"

MR. OLDEHAM: "It's forty candle-power, dearie."—*Paul S. Powers.*

SCIENTIFIC HUMOR AN HISTORIC DRIVE

Extract from St. Louis "Globe Democrat"—"His drive from the third tee went 125 *years* straight for the pin and dropped."—*W. O. Milligan.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chante here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. We cannot return unaccepted jokes. Please do not enclose return postage.

All jokes published here are paid for at the rate of one dollar each, beside the first prize of three dollars for the best jokes submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.

MAKES US FEEL LIKE 30c TO PRINT THIS

One day a professor was out hunting when quite unexpectantly a heavy rain storm came up. He crawled into a hollow log which kept the rain off very nicely. But the log became so water-soaked that it was impossible for him to squeeze out. He finally came to the conclusion that it was his fate to die there in that log, and he began to think of the many mean things he had committed, when suddenly he remembered that he had not renewed his subscription to "SCIENCE AND INVENTION." That made him feel so small that he was able to crawl out of the log without difficulty.—*Edward M. Carr,* Reporter No. 10224.

OSCILLATIONS OR OSCULATIONS?

MADGE: "How did you miss so much of the radio concert after staying home last night to listen in?"

MARJORIE: — "Charlie called and there was too much interference." — *J. J. O'Connell.*

THIS SUIT NEEDED NO IRONING

CUSTOMER: "Say, this suit is rusty already and I bought it last week."

CLERK: "Didn't I tell you that it would wear like iron."—*J. C. Mello.*

ROASTING A FRESHMAN

PROFESSOR: "I'm getting some rare work from the new freshman."

ASSISTANT: "Rare?"

PROFESSOR: "Yes, not well done."—*Charles A. Hall.*

—OR SOME RAINMAKER, PFD.

WALL STREET LAMB: "Never again! I put money into a coal mine and it caught on fire. Then I tried an oil well and it was struck by lightning."

STOCK SALESMAN: "In that case, I have just what you need. Our company is developing an asbestos property."—*J. J. O'Connell.*

AND THEN HE RECOVERED IN THE HOSPITAL

SHE (combing hair): "Look, my hair is full of electricity."

HE: "Why, of course, it's connected to a dry cell."

MORE HOLY THAN RIGHTEOUS

TEACHER: "What insect lives on the least food?"

BRIGHT STUDENT: "The moth; it eats holes."

AND THE SWISS SCHWEITZER CHEESE?

PROF. (in history class): "It is an interesting fact in psychology of nations that when the Prussians commit suicide, they always use prussic acid."

INQUISITIVE FRESH.: "And then, do the French use Paris green?"—*A. Daansen.*

WELL IT HAD DRAWING POWERS

When Johnny was sent on errands, he often irritated his mother by lingering on the way to watch the magnetic crane lifting iron in the rolling mills, and one day she was punishing him when his father returned from work.

"What are you whipping him for?" asked Father.

"He's got too much iron in his blood," replied Mother.

"What!" exclaimed the astounded man.

"Yes, he just can't get away from that magnetic crane."—*H. F. Richards.*

IT HAPPENS TO ALL OF US

"What ails George anyway? He looks so sad and despondent."

"Oh! He thought he had picked up a new station way out west somewhere—but he suddenly discovered it was only the phonograph in the flat above."—*H. C. Newton.*

BUT HE DIDN'T TAKE 'EM

"TOURIST: "To what do you attribute your great age?"

OLDEST INHABITANT: "I don't know yet, there's several o' them patent medicine companies bargaining with me."—*James Wa*

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THE ORACLE

The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all but only matter of sufficient interest will be published. Rules under which questions will be answered:

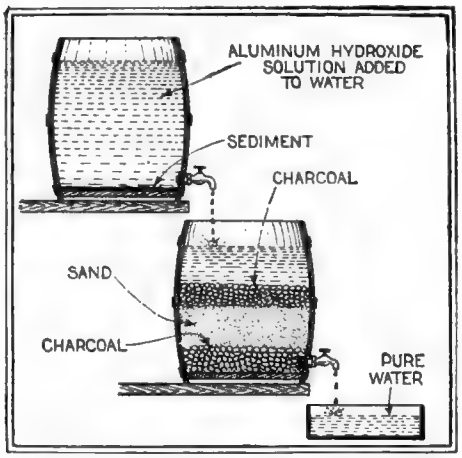
1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink, no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 25 cents is made for each question. If the questions entail considerable research work or intricate calculations a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

WATER FILTER

(1797) Roger V. Brink, San Antonio, Texas, asks:

Q. 1. How can I purify and filter water taken from a small brook?

A. 1. It is best first to purify and then filter the water. By means of precipitation with potassium aluminum sulphate alum, this can be readily accomplished. For every gallon of water, add two grains of alum, and allow the turbid mixture to stand over night. The clear water is then decanted or siphoned off, after which it is passed into a tank containing pulverized charcoal and layers of sand. Here any slight traces of chemicals are removed and the water is as fresh and clear as could be desired.



The purification of water is an absolute necessity and must be done in a thorough manner. No matter how dirty, water can always be made fit to drink.

BIRTH STONES

(1798) Robert L. Christman, Allentown, Penna., asks:

Q. 1. Will you kindly publish a list of the stones that are generally used as tokens of esteem, love and appreciation?

A. 1. The desired list is given herewith.

Month	Stone
January	Garnet.
February	Amethyst, Hyacinth, Pearl.
March	Jasper, Bloodstone.
April	Diamond, Sapphire.
May	Emerald, Agate.
June	Cat's Eye, Turquoise, Agate.
July	Turquoise, Onyx.
August	Sardonyx, Carnelian, Moonstone, Topaz.
September	Chrysolite.
October	Beryl, Opal.
November	Topaz, Pearl.
December	Ruby, Bloodstone.

SOAP SOLUTION

(1799) William A. Lathrop, Chatham, N. J., says he is experimenting with soap films and is desirous of obtaining a good soap solution for making these films. He asks:

Q. 1. Can you help me out?

A. 1. A very good soap solution would be composed of pure castile or palm-olive soap, 1 ounce, distilled water 8 ounces and pure glycerine, 4 ounces. The soap should be cut into thin shavings and be dissolved in distilled water. When thoroughly dissolved, add the glycerine and mix well. The mixture is then allowed to stand over night and the clear portion of it at the bottom of the container is syphoned off and used. If a few drops of amyl acetate are poured on the surface of a vessel containing pure water, it will spread out. By using a wire bent into different forms, the thin film can be readily picked up and will cover the form completely, exhibiting brilliant hues. If celluloid is dissolved in the acetate, the film is made more durable and will last for quite a while.

PIPE THAWING TRANSFORMER

(1800) Milton Williamson, Buffalo, New York, desires data on a step-down transformer to be operated on 110 volt, 60 cycle A. C. supply for pipe thawing.

A. 1. The data given herewith can be used to construct a two K. W. transformer giving a secondary potential of about 12 volts and developing approximately 150 amperes. On the laminated sheet iron core, which should measure 17¼" long x 18¾" wide and having a cross section of 2¼" x 2¼", is wound the primary winding consisting of 244 turns of No. 8 D.C.C. magnet wire. Care must be taken in using sufficient Empire cloth for complete insulation. The secondary winding is composed of two No. 3 wires, wound in parallel and consists of 32 turns. Extreme care should be taken in handling the output of the transformer.

Interesting Articles to Appear In February Issue of "The Experimenter"

The Tauleigne Microphone Amplifier.

Lessons in Elementary Glass Blowing, By Earle R. Caley.

Listening in for the Stars, By William Grunstein, E. E.

Heating Metals Under Water, By R. A. Goepfrich.

Ball Lightning.

Galvani and His Work.

A 13,000-Ampere Storage Battery.

WATER WHEELS

(1801) William Richards, Pasadena, Calif., asks:

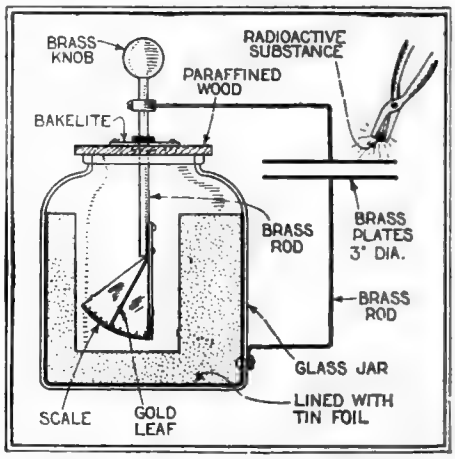
Q. 1. Can you give some information as regards the efficiency of water wheels?

A. 1. There are three different methods used in the operation of water wheels, the types of which are as follows: The undershot, the breast-wheel and the overshot wheel. The undershot wheel is used mostly in the development of small power such as in small streams, brooks and slowly moving rivers and has the lowest efficiency of all. The breast-wheel is employed in some cases where a medium head of water is available, and where it is impractical to erect any other type. The breast-wheel has a slight advantage over the undershot wheel. The overshot wheel is the most efficient and can stand high head pressure. Whereas in the undershot wheel, a very small portion of the buckets or vanes are in contact with the water and in the breast-wheel type, only about one-third of the wheel is in contact with the water, it is plainly ascertained that in the overshot type practically half of the wheel is constantly in use, thus giving much greater efficiency.

ELECTROSCOPE

(1802) James F. Dickson, New Orleans, La., asks:

Q. 1. Can you kindly give me the details concerning the construction of a device used in detecting radio-activity?



A sensitive device for detecting radio-active substances is an instrument known as an electroscope. Its complete construction is detailed clearly above.

A. 1. The electroscope as used in the study of radio-activity and ionization is a very simple instrument to construct and if properly made will give very good results. By using an instrument such as described herewith, Mme. Curie was able to detect a particle of radium weighing but one-hundred millionth of the weight of a single red blood corpusle. It was discovered by Faraday that due to electrostatic induction, the reading of any electroscope could not be considered as absolute, unless it was enclosed in a grounded metallic container. To alleviate this, the container is lined with tinfoil on the inside. Glass is much preferred in building it, while a paraffined wooden top, having a bakelite center piece should be employed. A heavy brass rod, terminates at the top end in a brass ball and has affixed at the other end a brass plate and scale. A long and narrow strip of gold leaf is attached by means of a weak solution of gelatin in warm water, acting as the adhesive. Since the gold leaf cannot be touched by the hands, it is advisable to use a knife blade or soft brush or other available instrument to aid in fastening it.

COMPOSITION OF THE ATMOSPHERE

(1803) John B. Treyor, China Pond, Carmel, New York, asks:

Q. 1. Will you kindly tell me the composition by volume of the various constituents of the atmosphere?

FREE INFORMATION

IF you want additional information concerning any of the subjects illustrated and described in this number of SCIENCE AND INVENTION we shall be glad to give you other data we have at our command. To make this work as easy as possible for our editors, please be brief. Write only on one side of the paper and state exactly in a few words just what it is you desire further information on. We have the original manuscripts and drawings of many of these articles in our files and can furnish much additional data in most cases. Please do not fail to send stamped and self-addressed envelope. Make all questions concise and specific.

Address all inquiries of this nature to INFORMATION EDITOR c/o Science and Invention, 53 Park Place, New York City.

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A. 1. We are giving you the desired information below.

Nitrogen, 78.03%; Oxygen, 20.99%; Argon, 0.94%; Carbon Dioxide, 0.03%; Hydrogen, 0.01%; Neon, 0.0012%; Helium, 0.0004%.

Besides these, there are the various oxides of nitrogen, ozone, water vapor, dust, sulphur fumes, etc.

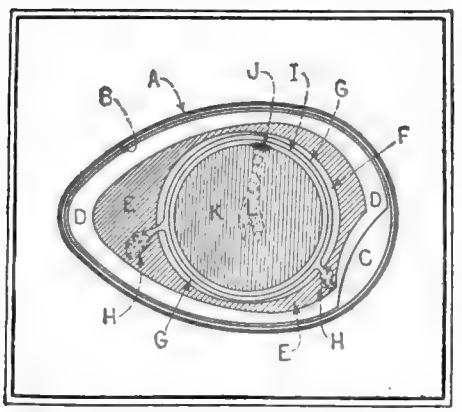
Q. 2. What is the weight of air?

A. 2. The weight of air is taken as 0.001293 grams per cubic centimeter.

THE EGG

(1804) Rupert Tucker, Jersey City, N. J., desires information concerning the structure of delectable hen fruit.

A. 1. With the daily enormous consumption of eggs through the entire world, it is truly remarkable that we are able to have them strictly fresh on our table. Eggs contain a relatively large portion of proteids, and also mineral matter which latter goes to furnish the salts of the bones, especially calcium phosphate. The egg is one of the most concentrated forms of nutriment in that it furnishes also fat. Proteids serve as a fuel for the body and also provide nitrogen which is very much needed for growing children and in the case of old people to keep the body in repair. So-called egg substitutes have been placed on the market, but strange to say, although claims were presented that they contained all the ingredients of eggs, most of them fell far short. They are composed of other forms of protein matter, usually casein from milk, colored to resemble the egg in tint. Roughly speaking, the egg contains about 70 per cent. of water, 12 per cent. albumin and 12 per cent. fat. What is known as the white of the egg, or albumin, when separated from the yolk, membrane and shell, is a colorless, glary fluid, soluble in water. When the white of an egg is put into boiling water, it undergoes a remarkable change and enters a state of coagulation. In this state it is insoluble in water and opaque, forming a solid mass which however still contains a large proportion of water. It is probable that during coagulation, chemical as well as physical changes may have occurred. It is to this extent that the white of an egg is extremely unstable and of a complex nature, its fixed properties being so indefinite that it is hard to say whether it is a definite chemical compound. The egg albumin may be taken as the representative of a group of substances classified together as proteids or albuminoids. It contains five elements, namely, carbon, hydrogen, oxygen, nitrogen and sulphur. The last named element is the cause of the odor of decaying eggs.



What an egg looks like when viewed sectionally. "A" is the shell; "B," double membrane of shell; "C," the air chamber; "D," the outer or fluid albuminous layer; "E," thick, middle albuminous layer; "F," inner albuminous layer; "G," membrane of the Chalaza; "HH," the Chalaza; "I," Vitelline Membrane; "J," Germ; "K," Yolk; "L," Latebra. (After Macé.)

The yolk of the egg is composed of albumin, fat and phosphorous bearing material known as lecithin. It is a well known fact that the yolk of an egg is a much richer food than the white and contains in addition to the nitrogenous element the fat and mineral bodies necessary to nutrition. Due to the porous nature of the shell, the contents within gradually grow less by evaporation and the egg loses weight. Again, air passes through the shell pores, carrying with it various microbes, thus resulting in ultimate decomposition and spoiling the egg. On the surface of the shell, however, there is a thin coat of mucilaginous matter which is easily washed off. As this coating tends to keep the pores closed, it is best for obvious reasons that eggs should not be washed.

Preservation of the egg can be accomplished by artificially coating with a thin coat of varnish, thus rendering it impervious to moisture and air. Water glass or sodium silicate is used to a great extent. However, when boiling eggs so treated, there is the disadvantage of having them break very easily.

Eggs can be tested in various ways, one of which is the salt water test. If perfectly fresh, the egg will sink to the bottom. If it remains immersed in the liquid, it is thought to be about three days old and if it rises to the surface and floats, it is safe to say that it is at least a week old. However, preserved eggs cannot be gauged by these means since it is useful only for eggs that have been kept in the air. The best test for examining eggs is candling, a process which consists of placing the egg between a source of bright light and the eye. When fresh, the egg will show a uniform rose colored tint without any dark spots whatsoever. To make sure that an egg is fresh, it is advisable to break it open and examine the contents as to its odor and taste. In cooking eggs, they should be placed in water about 175°F. in which they should be allowed to remain for ten minutes. As a result, the yolk will be found to be more coagulated than the white—the egg albumin beginning to coagulate at 134° F. and requiring some time to heat the egg throughout. Thus it is not best to actually boil eggs.

AERIAL NAVIGATION INSTRUMENTS

(1805) William J. Crane, Seattle, Wash., desires:

Q. 1. Kindly publish a list of the essential instruments and indicators used on airplanes and dirigibles and other aerial navigating ships.

A. 1. The most essential instruments for navigation in the air are, the compass which indicates the direction in which the air craft is pointing; the air speed indicator, giving the speed of the airship relative to the air; the altimeter, indicating height. Then there is a multiplicity of other instruments which give certain other necessary data and are known as follows: The turn indicator, to assist in flying through clouds; the aero-bearing plate, for fixing position and determining ground speed and drift (from which the wind velocity may be determined); a course-setting instrument by which the operation of course-setting, radius of action, interception, correction of wrong course or calculation of wind may be carried out. Precision thermometers, barometers, and hygrometers are also carried. In addition, a sextant is sometimes carried, but it is only effective for taking bearings to celestial bodies during an ocean passage or at night.

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers only with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. For your convenience, we are appending herewith a blank which we ask you to be good enough to fill in and hand to your newsdealer. He will then be in a position to supply copies to you regularly every month. If you are interested in receiving your copy every month, do not fail to sign this blank. It costs you nothing to do so.

To ..... Newsdealer

Address .....

Please reserve for me.....copies of SCIENCE & INVENTION every month until I notify you otherwise, and greatly oblige,

Name .....

Address .....

ASTRONOMY

(1806) Loren Lorensen, Brooklyn, New York, wants to know:

Q. 1. What is the force which holds the planets in their orbits? I understand that the sun has something to do with it, but do not understand what force counterbalances this attraction. What causes the planets to rotate on their axis, also why is it that the planets such as Jupiter and Saturn rotate on their axis many times faster than our earth? Kindly explain in full detail.

A. 1. We have referred your letter to Mrs. Isabel M. Lewis, M. A., of the United States Naval Observatory at Washington, D. C., who writes as follows:

"You ask what is the force which holds the planets in their orbits and what force counterbalances it. It is the gravitational attraction of the sun that holds the planets in their orbits. Every particle of matter in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of their distance apart. This is the universal law of gravitation discovered by Sir Isaac Newton. The law of gravitation for falling bodies at the surface of the earth was known before the time of Newton, but he showed that the law of gravitation is *universal* and is the force that holds the heavenly bodies in their orbits. It is the tendency of every body to travel in a straight line if undisturbed by outside forces. The gravitational attraction of the sun is the force that keeps the planets from going off at a tangent to their orbits.

"The planets probably rotate on their axes because they received the rotational impulse at the time of their origin from the original solar mass. The earth, Mars, Jupiter and Saturn rotate on their axis from west to east, the direction of their revolution around the sun. There is some uncertainty as to the direction of rotation of the other planets because their surfaces cannot be seen well enough to determine the direction in which they rotate. Nearby bodies of large mass would have a very great effect on the direction of rotation of any member of the solar system. The moon, for example, always keeps the same face turned toward the earth. This peculiarity of rotation is probably due to the manner of its origin and nearness to the earth. We cannot say why Jupiter should rotate so much more rapidly than the earth, because we do not yet know how the planets originated. That is one of the problems the astronomers are still puzzling over.

"Jupiter and Saturn may, in a way, be considered to be semi-suns. Their densities do not differ greatly from that of the sun. They do not shine by their own light, however, and they give forth little if any heat. They are doubtless largely in a gaseous state. Jupiter may be partly in a molten state. Beyond a doubt, both of these bodies are surrounded by dense vapors. Their interiors may be very hot even if little or any heat escapes to outer space. The density of Saturn is less than that of water so it must be chiefly gaesous. Certainly neither of these bodies have solid surface crusts. There are certain definite facts known about these planets such as size, mass, density, rotational periods, presence of dense atmosphere, etc., but there are other facts that are not so well known and we can only speculate about these at present."

RELATIVITY

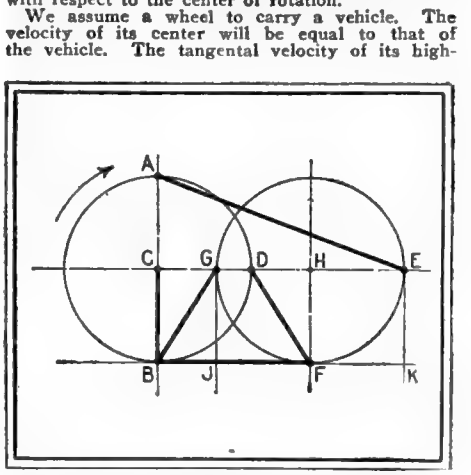
(1807) Charles C. Johnson, St. Louis, Mo., wants to know:

Q. 1. Is it true that the upper portion of a wheel travels faster than that part in contact wih the ground?

A. 1. While it is true that the upper portion a wheel has less resistance than the lower part in contact with the ground, due to the fact that there is such little compression in the members of the wheel and also that each point on the periphery of said wheel is fixed in relation with any other point and with the center, it remains clearly evident that one part cannot go faster, actually, than any other.

Let us refer to the diagram. We have here a wheel with center C. Suppose we move said wheel ¼ of a turn and we will have as a result the wheel with its center now at H. B will have traversed the distance BG, while A, the distance AE; and D the distance DF. With relation to the earth, B will have moved the distance BK. Note the relative values of the distances BJ and BK that simply denote the relative speeds of both the lower and upper portions of the wheel. However, both the actual linear and angular velocities remain the same for A and B. Thus you can see that relatively, with relation to a fixed point on the earth, there is quite a large difference in the speed of different points on the periphery of the wheel, but actually each point has the same angular and linear velocity with respect to the center of rotation.

We assume a wheel to carry a vehicle. The velocity of its center will be equal to that of the vehicle. The tangental velocity of its highest part will be twice the velocity of the center, while the part touching the ground will be stationary, but this relation only persists for an infinitely small space of time. The question is often propounded as a sort of catch.



Does the top of a wheel really go faster than the bottom? Relatively, yes, but virtually it is foolish to conceive of such as an actuality. Note the diagram carefully.

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Awards in $1000 Monthly Contest

The Regular Departments Pay Prizes of Their Own. Authors on Contract Receive Their Own Rates; this, With Other Special Payments Makes the Total Paid for Articles in Excess of $1500.00 Monthly.

FIRST PRIZE $100.00

Trick Sub-Sea Photography, by Edwin Schallert.....980-981

SECOND PRIZE $75.00

Social Life of the Ant, by Dr. Ernest Bade.....982-983

TWO PRIZES OF $50.00 EACH

Find the Hair—Find the Criminal! by Mel Wharton..... 984
How to Build an Auto Speedster, by George A. Luers..... 1004

THREE PRIZES OF $35.00 EACH

Poison Gas Shells, by Lieut. Robert E. Sadtler, U. S. Army.. 989
How We Digest Foods, by Ismar Ginsberg..... 1000
One Hundred Foot Aerial Tower, by Fred A. Parsons..... 1015

FIVE PRIZES OF $25.00 EACH

Shooting the Air to Test Wind, by Ernest Brennecke..... 976
Automatic Railroad Crossing Gate, by J. W. Von Stein..... 977
Phosphorescence, by Raymond B. Wailes..... 997
Stunts for Smoker, by Walter B. Gibson..... 999
A Low-Loss Broadcast Receiver, by Frank Frimerman..... 1016

FIVE PRIZES OF $20.00 EACH

If New York City's Water Supply Should Fall as Rain, by C. N. Holmes 977
Safety Razor Blade Gives 400 Shaves, by O. H. Knoon..... 993
Stereoscopic Movies, by O. A. Owen..... 996
Some Unsolved Riddles of Science, by O. Ivan Lee..... 996
Soap Doll Actor, by Latimer J. Wilson..... 1002

TEN PRIZES OF $15.00 EACH

Fireworks Photo, by J. M. Howard..... 996
An Emergency Foot Bridge, by P. C. v. Petegem..... 1006
Small Microscope from Glass Beads, by Ed. Kuwatch, Jr..... 1006
Time Glass, by F. R. Newton..... 1007
Magnetic Snake, by S. Leonard Bastin..... 1007
Egg Trick, by C. L. Walter..... 1007
Novel Experiments with Heat, by Earle R. Caley..... 1008
Hookup, by E. E. Laufer..... 1017
Hookup, by J. B. Cook 1017
Hookup, by Mathias Thury 1017

FIFTEEN PRIZES OF $10.00 EACH

For Walkers (author send address) 1003
Hammer Kink, by Florence E. Moore..... 1007
Printing Mask, by A. P. D'Ambra..... 1007
Soldering Iron, by George A. Coates..... 1007
Paper Holder, by S. Schlesinger..... 1008
Jar Rack, by E. M. Quimby..... 1008
Letter Scale (author please send address)..... 1008
Poem—George Gray 1059

(No further Entries)

$13,320.00 in Prizes Paid Last Year

WITH the December issue our $12,000 a year prize contest came to a happy conclusion. Not only did we pay out $12,000 in prizes as announced in our November, 1923 issue, but we did actually pay out in prizes alone, not less than $13,320.00 to 1,112 winners. These prizes every month ranged from the first prize of $100.00 down to the smallest prize winner of $1.00 each.

Up to the time of going to press, SCIENCE & INVENTION had no less than 18,590 reporters scattered over every section of the globe. These reporter-contributors have sent in an avalanche of material, and their efforts have been fruitful in that they have won prizes.

SCIENCE & INVENTION aims to print the news first, if it is interesting and to otherwise excel in the reporting of science and invention. Small wonder then that with the enthusiastic co-operation of our thousands of Reporter-Correspondents, SCIENCE & INVENTION today occupies an enviable position in the scientific press.

The $12,000.00 prize arrangement has worked out so satisfactorily during the year just closed that we have decided to extend it for another year and we hope that our correspondents will be as successful in winning prizes for the coming year as they have been during the past one. We wish to thank all of our friends for their co-operation and wish them the best of luck for the coming year.

Note New Prize Schedule.

Here Is How You Can Get in the Contest:

$12,000 or More in Gold

EVERY month SCIENCE AND INVENTION pays $1,000 or more in gold in prizes. Every text article published will receive a prize—(most of the departments have awards of their own which they give every month). Ideas are what the Editors want. The ideas must be told simply, so that your mother or your sister can understand them—in pictures or sketches or both. But the idea must be new and must have something to do with science or invention.

The Editors want pictures and sketches—must have them—but what they want most is IDEAS. These ideas will be handsomely paid for. We have published a pamphlet showing the rules of the contest which we shall be glad to send to anyone free on receipt of a postal card with your name and address. The pamphlet gives full details, the rules and how to submit articles. The magazine itself shows you what is wanted. Study it closely and submit your ideas.

The closing date for all prize contributions is the 15th of the month preceding date of issue, *i.e.*, the 15th of Feb. for the April issue, the 15th of March for the May issue, etc.

82 monthly prizes will be given as follows:

FIRST PRIZE			$100.00	
SECOND PRIZE			$75.00	
2	PRIZES OF		$50.00	each
3	"	"	35.00	"
5	"	"	25.00	"
5	"	"	20.00	"
10	"	"	15.00	"
15	"	"	10.00	"
10	"	"	5.00	"
15	"	"	2.00	"
15	"	"	1.00	"

WILL YOU BE OUR REPORTER?

IN connection with our $12,000 prize contest announced herewith, it goes without saying that you will have to do a little work in order to win a prize. The Editors do not wish to make it hard for you, quite the contrary. We want pictures and ideas and we cannot have too many of them.

Herewith is reproduced our reporter's card. Up to now we have issued over 18,000 of these. Note in our awards how our reporters are winning prizes right along. We shall be glad to send the reporter's card free to anyone who makes an application for it. By means of this card you will be able to secure entry into industrial plants, business houses, motion picture studios, steamships, docks, public buildings, etc. This reporter's card will prove an open sesame to you in many instances. Every card is numbered and only one is given to a correspondent. A postal card from you and a request for this reporter's card is all that is necessary to obtain one. It will be sent to you by return mail. With it we will send you a pamphlet giving rules of the contest and how to proceed in order to get photographs, to send in sketches, and other information in order to obtain a valuable prize. Not only will this card help you to obtain material for this magazine, but it will train you to become a news gatherer, and will be the means of helping you to earn a good deal of money during your spare hours.

Address Field Editor. SCIENCE AND INVENTION, 53 Park Place, New York

REPORTER

Science and Invention

CORRESPONDENT
REPORTER'S
IDENTIFICATION
NO. 10009

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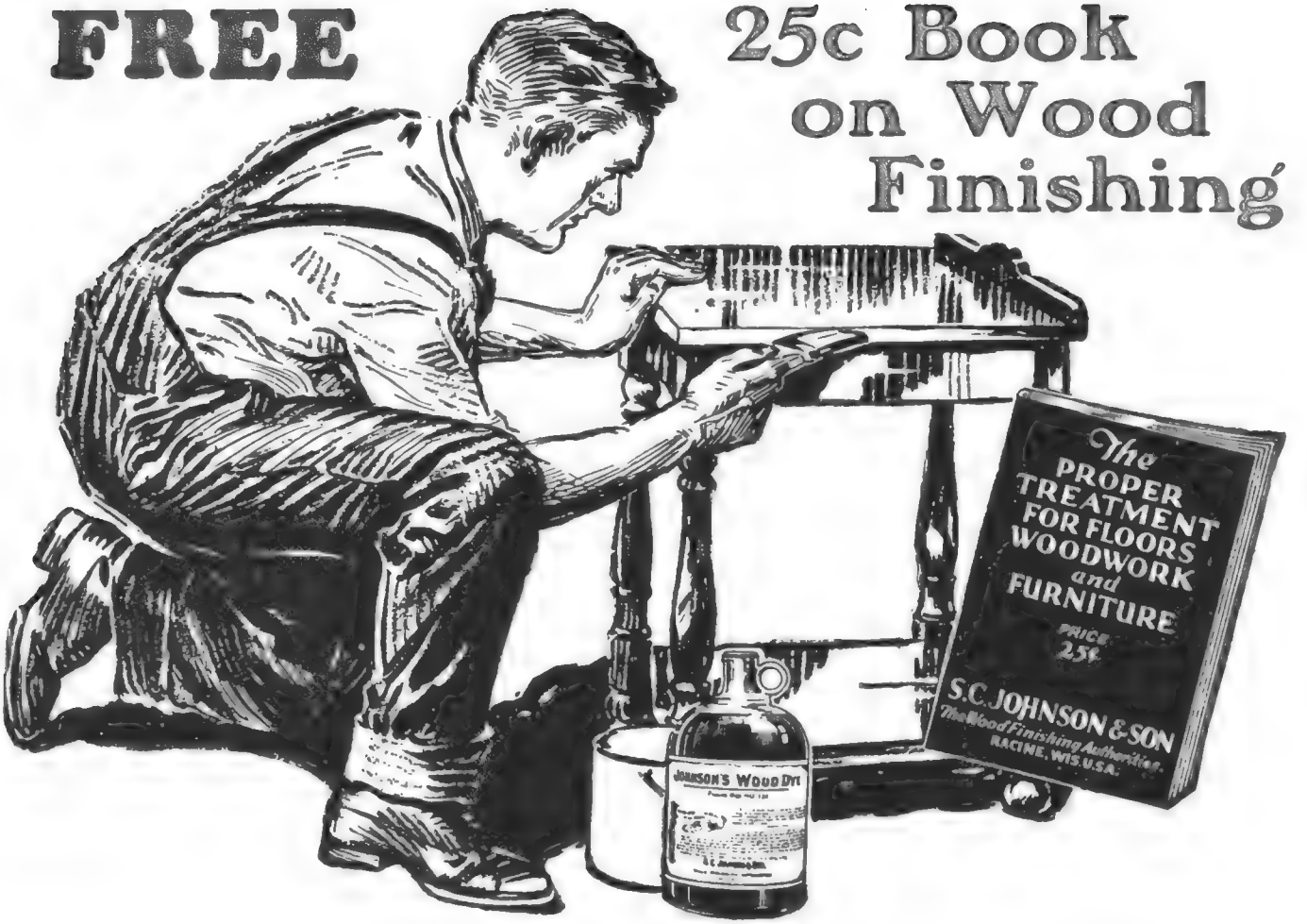
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Doctor Hackensaw's Secrets

By CLEMENT FEZANDIÉ

(*Continued from page* 991)

to a pick-pocket, for instance. He could see at a glance how much money each man was carrying in his pocket-book, and could know which ones were worth robbing.

The doctor remained obdurate, but alas, the locks in the office were of the most primitive kind. With the aid of a button-hook, Miggs was able to pick the lock of the closet, and that night at ten o'clock he was at the appointed trysting place, and a pair of the magic spectacles were in his pocket.

CHAPTER III

Miss Muriel Gold was the tool of a gang of professional yegg-men. Poor girl! She was not innately wicked, but she had succumbed to the wiles of a professional burglar, and after he had ruined her and taken her from her home, he had gradually forced her to help him and his pals in their nefarious schemes. The gang was well organized and very successful, with spies everywhere to report where good hauls were to be made.

One of these spies was in Doctor Hackensaw's employ. In some way this fellow had heard of the Z-ray spectacles, and the chief of the yegg-men, on learning of the existence of this wonderful device, resolved to obtain a pair of the spectacles at any cost. Evidently the simplest way was to use Muriel Gold as a lure, and she, much as she disliked the task, dared not refuse. She was wholly in the power of the gang. Hence, it was that she had waited for Miggs at the theatre, and hence it was that she met him the second time to bring him in her auto to one of the lairs of the gang.

Miggs did not have long to wait for her. Scarcely had he stationed himself in front of the theatre, when the young lady made her appearance in her auto.

"Have you got the spectacles, Miggs?" she asked eagerly.

For an answer, Miggs slapped his bulging pocket.

"'Then jump in quickly and come to my house, and I will explain to you what I wish you to do. It will be the chance of your lifetime to make your name as a detective."

A half hour's ride brought the pair to a house in an unfrequented part of the city. Here the young lady descended, and, followed by Miggs, entered the house. Muriel conducted him into a parlor, and was delighted with the spectacles whose operation Miggs carefully explained to her.

"Now, Miggs," said the young lady, "I will explain what I wish you to do. But as I shall need you for a couple of weeks, you'd better write a word to Doctor Hackensaw to tell him you are called to the bedside of a dying relative in Chicago and that you will be gone for some time. Then we shall have lunch and you can start on your career as a detective immediately afterwards."

Miggs cheerfully wrote the letter, and then refreshments were served. But the drink served to our hero was drugged, and it was not long before he felt a drowsiness steal over him, and was soon sound asleep.

It was hours before he awoke again, and when he did he found himself a prisoner in a small but comfortable cell, but with iron bars on the windows. And the magic spectacles had disappeared!

CHAPTER IV

From that day on, New York city was startled by a series of astonishing safe-rob-

(*Continued on page* 1028)

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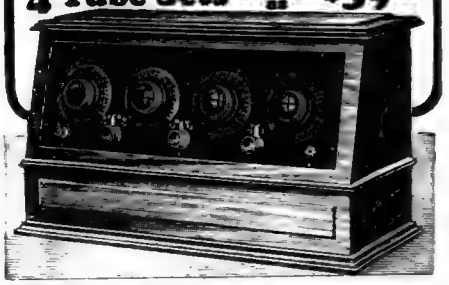

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Doctor Hackensaw's Secrets

(*Continued from page* 1026)

beries. How the burglars obtained their information was a marvel, for their robberies were timed to occur on the very night when there happened to be important sums in the safes. It seemed certain that there must be collusion between the burglars and some trusted employes, but in many cases the employe had served faithfully for years. The thing was apparently inexplicable, yet the explanation was simple.

Muriel Gold could have thrown considerable light on the matter, for it was usually she who visited the different banks or business houses, and by means of the magic spectacles looked through the walls of the safes to see if they contained anything worth taking—she also, when visiting her friends in the fashionable world, looked through the spectacles into their bureau-drawers to see if there were any pearl necklaces or other jewels worth stealing. No hiding place was secure against her piercing eyes, and for many a rich haul was the gang indebted to these Z-ray spectacles.

Meanwhile Doctor Hackensaw had not missed the spectacles. He had received Miggs' note, so was not worried about the boy. But it so happened that the doctor was asked to rewrite a magazine article about the value of these new Z-ray spectacles.

He had accordingly begun by setting forth their value to the police. A detective equipped with these spectacles could spot at once a revolver in a man's hip-pocket, a razor concealed in his boot, or a set of burglar tools in his valise. They could look through the walls of a counterfeiter's den and see the men at work. They could secure evidence against gambling houses in the same way, and could detect loaded dice or faked roulette wheels at a glance. The smuggling of "hootch" would be a thing of the past when a single look through these spectacles would reveal its hiding place in an automobile or coffin.

Custom-house officials would no longer need to turn the contents of travelers' trunks topsy-turvy. A glance into the closed trunk through the Z-ray spectacles would reveal smuggled goods without trouble. Passengers would be saved the indignity of a personal search, as the spectacles would reveal at once any forbidden goods concealed on their persons. Prisoners could no longer hope to bring concealed files or saws with them into their cells.

To physicians the spectacles would be invaluable. It would enable them to watch the working of every organ inside their patients. The slightest derangement would be manifest. Chemists could detect adulterations in their drugs, and manufacturers detect flaws in their castings. Mechanics could perceive internal crystalizations in their machines at a glance. A chauffeur could locate his troubles without having to take his car apart. In a word the uses of these spectacles were manifold. There was scarcely a branch of art or science which they would not materially benefit.

As he wrote, the doctor bethought him that he wished to locate some trouble he had with one of his new machines, so putting down his pen, he sought in his desk for the Z-ray spectacles he had shown Miggs. They were gone!

Instantly there flashed into his mind the boy's request for a loan of the spectacles. The inference was obvious. Miggs must have taken them without leave.

"What a lad!" exclaimed the doctor. "I'll bet he's up to some mischief!"

(*Continued on page* 1030)

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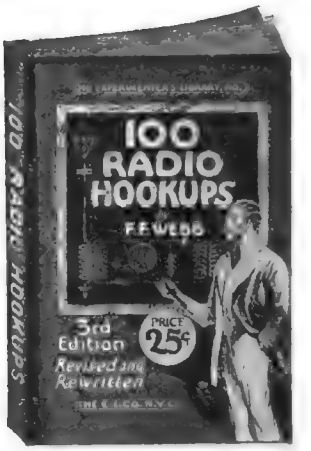

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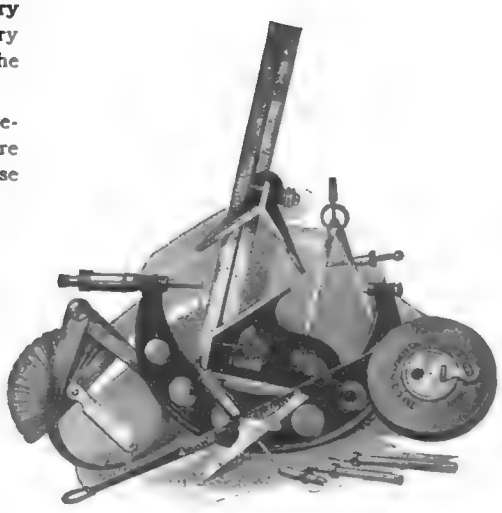

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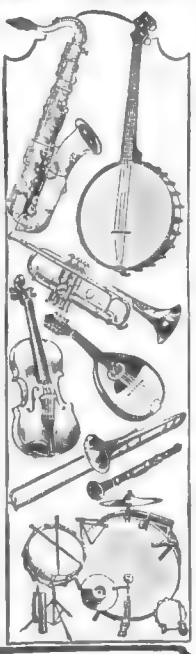

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Dr. Hackensaw's Secrets

(*Continued from page* 1028)

And then sub-consciously there arose in his mind the series of safe-robberies that had taken place in the last two weeks, and the connection between the two events struck him forcibly.

"Some gang of burglars have got hold of the spectacles!" he cried. "That explains the whole thing! That explains how they are able to tell which safes contain money. I must get those spectacles back at any cost. Luckily I can locate them easily. There are no other Z-rays in existence but those that I have produced. My special detector can locate them if they're anywhere within a thousand miles of here. In five minutes I shall know exactly where they are!"

It was but a moment's work to switch on the detector, and after carefully insulating his other Z-ray spectacles, he watched the indicating compass needle as it swung quivering around on the dial.

"The needle points almost due North," he soliloquized, "and the strength of the Z-waves indicates a distance of about five miles. The spectacles must, at the present moment, be somewhere in Van Cortlandt."

"Pep," he called aloud. "Do you want a chance to distinguish yourself by catching a gang of burglars?"

Pepita Perkins stopped her type writing with a jerk. "What!" she cried aghast.

"If you want to make a little pocket money, Pep, there are big rewards offered for the capture of this gang of yeggmen, and the recovery of the stolen goods. I'll send "Spaghetti" Joe with you and two or three other stout men to help him, while you can go along with another pair of my magic spectacles, and boss the whole affair."

The preparations took but a very few minutes. "Spaghetti" Joe was a reformed safe breaker, whom Doctor Hackensaw had taken into his employ. A full set of burglar tools was put into an automobile, for it might be necessary to break into a house or open a safe, and Joe was the man who knew how to do it. The men were also provided with special gas throwers designed to throw a soporific gas that would overpower the burglars and render them incapable of resistance. The detector was also taken along to guide them to the exact spot.

The five miles to Van Cortlandt were covered in no time, and the automobile soon brought them near a lonely house not far from Van Cortlandt Park. Here they descended from the machine and circled around the house, and to their gratification the needle of the indicating compass turned so as to point always directly toward the house. There was no doubting the evidence! The Z-ray spectacles must be somewhere within that building.

Pep therefore took her second pair of spectacles out of its insulated case, and creeping quietly up to the house, peered through the walls. In one room she saw a dozen men smoking, drinking, and playing cards—evidently the gang. In another room, a beautiful young lady was lying on a couch reading. This was Muriel. In still another room was a boy, locked in and vainly seeking some means of escape. Pep's heart gave a jump as she recognized Miggs.

Without a word Pep handed the spectacles to "Spaghetti" Joe who had followed her.

"It's too dead easy!" cried Joe. "They're all bunched in one room and half-drunk. We can get them without any trouble."

To open a window and climb into the house was the work of an instant. Pep, Joe and the three men put on their gas-masks,

(*Continued on page* 1032)

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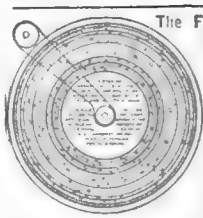

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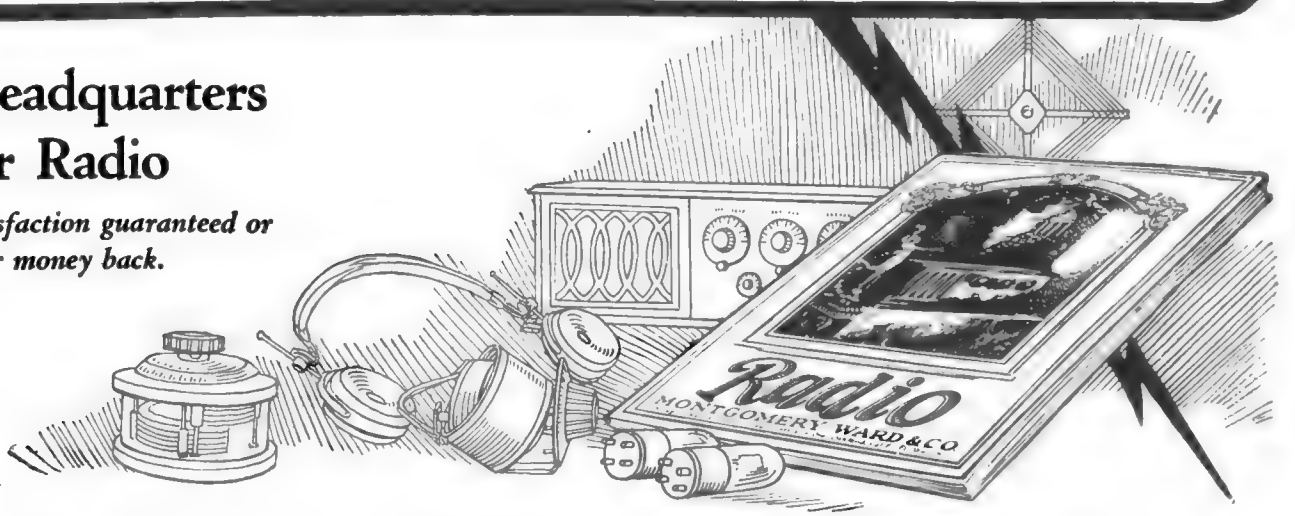

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Doctor Hackensaw's Secrets

(*Continued from page* 1030)

and then placing the nozzle of the gas-throwing instrument into the key hole of the room where the villains were assembled, shot the odorless but powerful soporific gas into the room. A minute later every member of the gang was unconscious, and before they recovered their senses they were strongly handcuffed. One of the villains who was not in the room at the time, gave them a little trouble, but "Spaghetti" Joe dexterously tripped him up and held him while Pep adjusted the handcuffs. As for Muriel, she made no resistance.

Miggs was delighted at regaining his freedom, and taking the stolen spectacles, he and Pep explored the house thoroughly for the hidden booty. It was concealed in several ingenious hiding places, some in panels in the wall, others in secret recesses in chairs and cupboards, but the greater portion was buried under the ash heap in the cellar. There were watches and jewelry of all kinds, heaps of bank notes and negotiable securities. In all there were over five hundred thousand dollars worth of valuables that the thieves could have cashed.

No hiding place, however, was secure against the magic spectacles. The Z-rays penetrated through the walls or through the floor and revealed the treasure beneath.

It was more work to secure the valuables than to discover them, but at last all were loaded in the automobile and with the fettered burglars piled in, the car started on its homeward trip, but it was past midnight when Doctor Hackensaw's house was reached.

The burglars all received long terms of imprisonment, but Doctor Hackensaw would not allow Muriel to be even arrested. She was only a tool. The kind-hearted doctor gave her a position in his office, and she proved worthy of the trust he placed in her.

A handsome reward was paid for the recovery of the stolen property, and Pep was delighted by the receipt of two thousand dollars in cash and a beautiful pearl necklace as her share. Even Miggs received a thousand dollars and a fine gold watch.

But Doctor Hackensaw thereafter kept his Z-ray spectacles locked up in one of his strongest safes.

"Every great invention," said he, "is a power; and a power may be used either for good purposes or for bad ones. These magic spectacles are too dangerous to be put into the hands of the general public!"

Reader's Forum

(*Continued from page* 1009)

(Not knowing to which article you refer and not knowing the context of your original communication, we cannot comment on the first portion of your letter.

With regard to your second statement we have this to say: In all cases in awarding the prizes for the Gold Cover Contest, the distinction although apparently fine to the reader, was quite definite in the opinion of the judges, one of whom at least was partly responsible for the contest, This worthy gentleman found that the ideas to which prizes were awarded were different from those featured by us and there was no collusion whatever.—Editor.)

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You can pay $150 or more for an outfit, or $200 or more for a set, but you cannot possibly buy a better set than this one.

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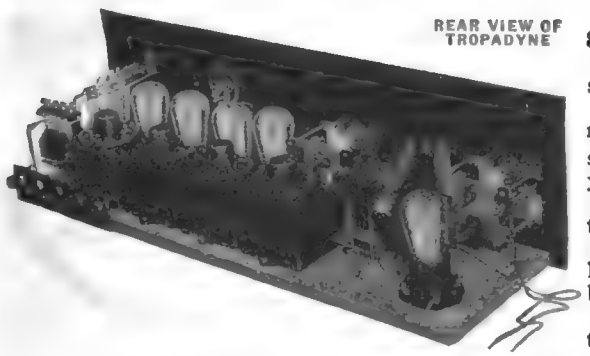

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Note These Important Features:

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MICROMETER VERNIER DIALS giving you the full advantage of the exceptionally sharp tuning.

OUTFIT IS ABSOLUTELY COMPLETE—Drilled panel, Mahoganite Cabinet and everything else needed, except tubes and batteries.

ECONOMY and SIMPLICITY—This is not a reflex, yet six tubes do the work for which other sets require eight to ten.

The Editor of the Radio News

In the August 1924 issue, said this about the **Tropadyne:** "Here is a remarkable receiver which we warmly recommend to our readers. It has several new and unusual features. In the first place only 6 tubes are used giving as much volume as the average 8 tube Heterodyne. The selectivity of this set is unusual. Unequalities of the intermediate transformers have now been done away with by tuning each transformer. After the transformer has been tuned, it can be left this way, no further tuning being necessary.

"This system makes for maximum sharpness and maximum volume. Another outstanding point of superiority of the Tropadyne circuit is that it practically does not radiate, thereby not interfering with other nearby receiving stations. A saving of two tubes as well as an increase of selectivity is obtained with this new circuit."

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***The above has been verified by* "RADIO NEWS"**

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PRINTING TELEGRAPH

(869) R. H. Twyman, Rivesville, W. Va., states that he has developed principles whereby an attachment can be made to an ordinary telegraph circuit, which will cause the message to be typed in letters instead of symbols. He asks if this device would be patentable and whether it would be of any value.

A. There are several devices of this type, patented by various large electrical and telegraph companies. All of these are covered by very broad claims and we are of the opinion that it would be practically impossible for you to obtain a patent on such a device. Furthermore, you would have to work against these large companies whose unlimited resources would make such a procedure impracticable. As you do not send any details of your device, we cannot comment upon its practicability, but considering the points mentioned above, we would not advise you to attempt to obtain a patent.

OBTAINING A PATENT

(870) Pascal P. Pratt, Buffalo, New York, wants to know whether or not an individual can obtain a patent without the assistance of an attorney. He also asks what the usual charges for obtaining a patent are.

A. 1. Drawings and claims of an inventon should preferably be drawn up by a patent attorney. The individual can do this himself, however, but it entails an expense greater than that which the patent attorneys charge. These drawings and claims are submitted to the Registrar of Patents, and the first Government fee of $20.00 is charged, and the serial number is given, and when the patent has been granted, a second fee of $20.00 is requested.

A search through the Patent Office records to establish a patent claim costs approximately $10.00 and drawings made up by the draftsman will cost $7.00 per page of illustration. The price for a patent varies when taken out by a regular attorney, and is approximately $110.00 for a patent with one sheet of drawings, provided that no interference results. This is about the lowest cost at which a patent can be obtained, considering all costs and charges.

DOUBLE HACKSAW BLADE

(871) E. H. Price, Charlotte, N. C., submits a design of a hacksaw blade provided with teeth on both sides. He asks whether or not this idea can be patented.

A. 1. The idea of a hacksaw blade with teeth on both sides has been patented for some time.

SAFETY DEVICE

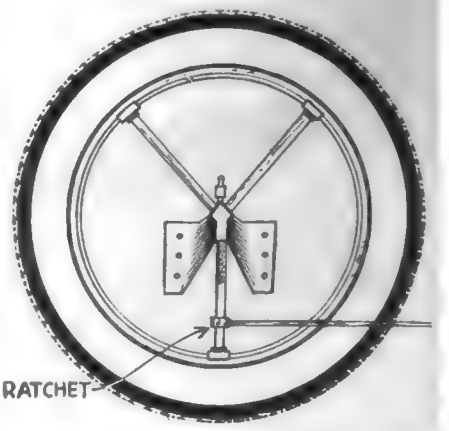
(872) L. Orman, Paterson, N. J., says that he has thought of a way whereby grade crossings on railroads can be made safe. He asks whether his idea is worth commercializing.

A. 1. At the present time it is almost impossible to place a railroad crossing safety device on the market, and unless you have plenty of available cash, we would not suggest that you patent the same. You might take up the matter with any of the railroad companies.

TIRE CARRIER AND RIM TOOL

(873) M. A. Chambers, Detroit, Mich., submits sketches and a description of a cleverly designed combination spare tire carrier and rim tool for use on automobiles which have split rims as part of their equipment. He asks our opinion on the device.

A. There seems to be several points of merit in your combination tire carrier and rim tool.



The tire rack and tool illustrated above possesses some novel points.

However, the average automobilist seldom if ever carries a device for splitting a rim. Usually one or two inflated spares are carried, which can be substituted when tires are punctured. The average automobilist will take punctured tires to a garage for repair. Therefore, garages are the places where rim tools are usually found. However, there seem to be enough good points about your combination to warrant your conducting a search through the patent files to determine whether or not the device can be patented. If you find it can be and you are willing to invest sufficient money in the project to obtain a patent, to manufacture the device and to advertise it extensively, we believe that you could make quite a good thing of it, if the combination is made to sell at a comparatively low price. Otherwise it would be well to forget the idea as practically every automobile is delivered to the purchaser equipped with a tire carrier. To use your combination it would be necessary to remove this and fasten on your device in place of it.

If you cannot finance the project yourself, there is a slight possibility that some manufacturer of automobile accessories would be interested. We would suggest a canvass of the various concerns in order to ascertain their viewpoint of the subject.

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Radio Teledactyl

By H. GERNSBACK

(*Continued from page 978*)

The technical end of the future invention has already been described by the writer above. In short, the new instrument is the human hand and arm projected into the distance. Such a mechanical hand at a distance can feel exactly the same as if the doctor was feeling the pulse of his patient in person. Using a television screen, the doctor manipulates his controls any way he chooses and the receiving teledactyl will faithfully reproduce the doctor's motions at the patient's bedside.

At the receiving end we have the feeling member, equipped with a sound collector or microphone, so that if the doctor chooses to place one of the controls over the patient's heart he can immediately hear amplified sounds of the heart-beats, the same as if he were at the patient's bedside. The writer may mention here that doctors have already listened to heart-beats of a patient a thousand miles away, located on a ship on the ocean, each heart-beat being transmitted faithfully by radio. But the future microphone does far more than this.

Doctors have come to know more and more that certain noises within arteries and muscles mean much if interpreted correctly. The supermicrophone of the future will, in a way, supplant the X-ray, because certain internal body sounds will mean certain things to our future physicians.

The patient's teledactyl control, aside from the microphone, will also have a very sensitive thermo-couple, by which a minute amount of heat can be measured. Very often, by means of such an instrument, so-called "hot boxes" can be located, which, particularly along the regions of the spine, greatly help in certain diagnoses. In other words, by means of a teledactyl "feeler," the microphone, and thermo-couple, a good doctor of the future can accurately diagnose a great variety of his patients' ailments.

The reader may ask the question here. "How does the patient get his teledactyl receiving instrument?" Again the answer is simple. The great doctor of the future will send his nurse to the patient with a small portable teledactyl, and the nurse will set up the instrument in front of the patient's bedside. The doctor and the machine do the rest. It is far better and cheaper for the doctor to send his nurse and save his time than to transport himself to the patient. In this way, the doctor will be able to treat four or five times as many patients as he could possibly do today. And, after all, if he is a really good doctor, he should have many patients.

It should be mentioned that the teledactyl will probably be used with very short wavelengths, possibly not more than two or three meters. At this short wave-length we can operate hundreds and thousands of radio instruments without any interference from each other's. With the present wave-lengths of three or four hundred meters this could not be accomplished without chaos.

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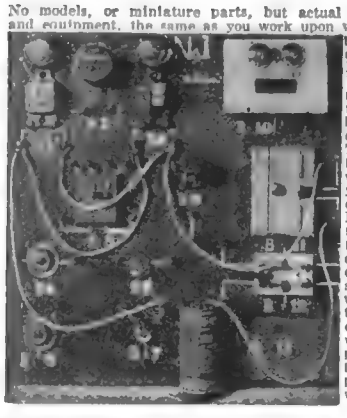

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First Group of Figures Indicate the Power in Watts in the Antenna of the Transmitting Station. The Second Group Gives the Wave-Length.

Call Letters	Location and Name	Power & Wave Length
KDKA	East Pittsburgh, Pa., Westinghouse Electric & Mfg. Co.	1000—326
KDPM	Cleveland, Ohio, Westinghouse Electric & Mfg. Co.	500—270
KDPT	San Diego, Calif, Southern Electrical Co.	50—244
KDYL	Salt Lake City, Utah, Newhouse Hotel	100—360
KDYM	San Diego, Calif., Savoy Theatre	100—280
KDYQ	Portland, Ore., Oregon Institute of Technology	50—360
KDZB	Bakersfield, Calif., Frank E. Siefert	100—240
KDZE	Seattle, Wash., Rhodes Department Store	100—270
KDZR	Bellingham, Wash., Bellingham Publishing Co.	50—261
KFAD	Phoenix, Ariz., McArthur Bros. Mercantile Co.	100—360
KFAE	Pullman, Wash., State College of Washington	500—330
KFAF	Denver, Colo., Western Radio Corp.	500—278
KFAJ	Boulder, Colo., University of Colorado	100—261
KFAN	Moscow, Idaho, The Electric Shop	50—360
KFAR	Hollywood, Calif., Studio Lighting Service Co.	100—280
KFAU	Boise, Idaho, Independent School District of Boise City, Boise High School	150—270
KFAW	Santa Ana, Calif., The Radio Den	10—280
KFAY	Medford, Ore., Virgin's Radio Service	50—283
KFBB	Havre, Mont., F. A. Buttrey & Co.	50—360
KFBC	San Diego, Calif., W. K. Azbill	5—278
KFBE	San Luis Obispo, Calif., Reuben H. Horn	50—242
KFBG	Tacoma, Wash., First Presbyterian Church	50—360
KFBK	Sacramento, Calif., Kimball-Upson Co.	100—283
KFBL	Everett, Wash., Leese Bros.	15—224
KFBS	Trinidad, Colo., Trinidad Gas & Electric Supply Co. and The Chronicle News	10—280
KFBU	Laramie, Wyo., The Cathedral	50—283
KFCB	Phoenix, Ariz., Nielson Radio Supply Co.	10—238
KFCF	Walla Walla, Wash., Frank A. Moore	100—360
KFCL	Los Angeles, Calif., Leslie E. Rice, Los Angeles Union Stock Yards	500—236
KFCP	Ogden, Utah, Ralph W. Flygare	10—360
KFCV	Houston, Tex., Fred Mahaffey, Jr.	10—360
KFCY	Le Mars, Iowa, Western Union College	50—252
KFCZ	Omaha, Nebr., Omaha Central High School	50—258
KFDD	Boise, Idaho, St. Michaels Cathedral	10—252
KFDH	Tucson, Ariz., University of Arizona	50—268
KFDJ	Corvallis, Ore., Oregon Agricultural College	50—360
KFDL	Denver, Colo., Knight-Campbell Music Co.	5—226
KFDM	Beaumont, Tex., Magnolia Petroleum Co.	500—306
KFDX	Shreveport, La., First Baptist Church	100—360
KFDY	Brookings, S. Dak., South Dakota State College of Agriculture and Mechanic Arts	100—273
KFDZ	Minneapolis, Minn., Harry O. Iverson	5—231
KFEC	Portland, Ore., Meier & Frank Co.	50—248
KFEL	Denver, Colo., Winner Radio Corp.	50—254
KFEQ	Oak, Nebr., Scroggin & Co. Bank	100—268
KFER	Fort Dodge, Iowa, Auto Electric Service Co.	10—231
KFEX	Minneapolis, Minn., Augsburg Seminary	100—361
KFFB	Boise, Idaho, Jenkins Furniture Co.	10—240
KFFE	Pendleton, Ore., Eastern Oregon Radio Co.	10—360
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KFFR	Sparks, Nev., Nevada State Journal	10—226

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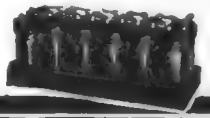

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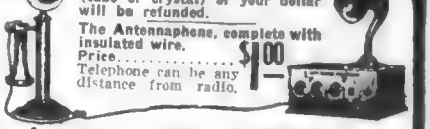

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KFGD	Chickasha, Okla., Oklahoma College for Women (J. A. Teeters)	50—252
KFGH	Stanford University, Calif., Leland Stanford Junior University	500—273
KFGL	Arlington, Ore., Snell & Irby	10—234
KFGQ	Boone, Iowa, Crary Hardware Co.	10—226
KFGX	Orange, Tex., First Presbyterian Church	500—250
KFGZ	Berrien Springs, Mich., Emmanuel Missionary College.	500—286
KFHA	Gunnison, Colo., Western State College of Colorado	50—252
KFHJ	Santa Barbara, Calif., Fallon & Co.	100—360
KFHL	Oskaloosa, Iowa, Penn College	10—240
KFHR	Seattle, Wash., Star Electric & Radio Co.	100—263
KFI	Los Angeles, Calif., Earle C. Anthony (Inc.)	500—469
KFIF	Portland, Ore., Benson Polytechnic Institute	100—360
KFIO	Spokane, Wash., North Central High School	50—252
KFIQ	Yakima, Wash., First Methodist Church	50—242
KFIU	Juneau, Alaska, Alaska Electric Light & Power Co.	10—226
KFIX	Independence, Mo., Reorganized Church of Jesus Christ of Latter Day Saints	250—268
KFIZ	Fond du Lac, Wis., Daily Commonwealth & Seifert Radio Corp.	100—273
KFJB	Marshalltown, Iowa, Marshall Electric Co.	10—248
KFJC	Seattle, Wash., Seattle Post Intelligencer	100—270
KFJF	Oklahoma, Okla., National Radio Mfg. Co.	225—261
KFJI	Astoria, Ore., Liberty Theatre.	10—252
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KFJM	Grand Forks, N. Dak., University of North Dakota	100—280
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KFJR	Stevensville, Mont. (near), Ashley C. Dixon & Son	5—258
KFJX	Cedar Falls, Iowa, Iowa State Teachers' College	50—280
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KFJZ	Fort Worth, Tex., Texas National Guard, 112th Cavalry	20—254
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KFKB	Milford, Kans., Brinkley-Jones Hospital Assn.	500—286
KFKQ	Conway, Ark., Conway Radio Laboratories	100—250
KFKV	Butte, Mont., F. F. Gray	50—283
KFKX	Hastings, Nebr., Westinghouse Electric & Mfg. Co.	1000—291
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KFLB	Menominee, Mich., Signal Electric Mfg. Co.	50—248
KFLE	Denver, Colo., National Educational Service	25—268
KFLQ	Little Rock, Ark., Bizzell Radio Shop	20—261
KFLR	Albuquerque, N. Mex., University of New Mexico	100—254
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KFLZ	Atlantic, Iowa, Atlantic Automobile Co.	100—273
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KFMT	Minneapolis, Minn., George W. Young	100—231
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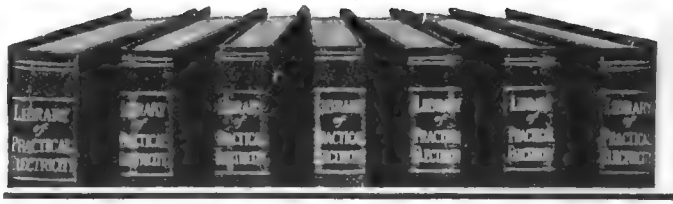

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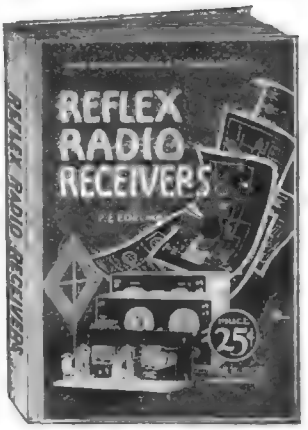
Call Letters	Location and Name	Power & Wave Length
KFOA	Seattle, Wash., Rhodes Dept. Store	500—455
KFOC	Whittier, Calif., First Christian Church	100—236
KFOD	Wallace, Idaho, The Radio Shop	10—224
KFOF	Marshfield, Ore., Rohrer Electric Co.	10—240
KFOJ	Moberly, Mo., Moberly High School Radio Club	5—246
KFON	Long Beach, Calif., Echophone Radio Shop	100—234
KFOO	Salt Lake City, Utah, Latter Day Saints University	10—261
KFOR	David City, Nebr., David City Tire & Electric Co. (Howard A. Shuman)	20—226
KFOT	Wichita, Kans., College Hill Radio Club	50—231
KFOU	Richmond, Calif., Hommel Mfg. Co.	100—254
KFOX	Omaha, Nebr., Technical High School	100—248
KFOY	St. Paul, Minn., Beacon Radio Service	50—226
KFOZ	Fort Smith, Ark., Leon Hudson Real Estate Co.	20—233
KFPG	Los Angeles, Calif, Oliver S. Garretson	10—238
KFPH	Salt Lake City, Utah, Harold C. Mailander	50—242
KFPL	Dublin, Texas, C. C. Baxter	15—252
KFPM	Greenville, Texas, New Furniture Co.	10—242
KFPN	Jefferson City, Mo., Missouri National Guard, 70th Infantry Brigade	10—242
KFPO	Denver, Colo., Colorado National Guard, 45th Division Tank Co.	500—231
KFPP	Olympia, Wash., G. & G. Radio & Electric Shop	20—236
KFPR	Los Angeles, Calif., Los Angeles County Forestry Department	500—231
KFPT	Salt Lake City, Utah, Cope & Johnson	500—268
KFPV	San Francisco, Calif., Heintz & Kohlmoos	50—236
KFPW	Carterville, Mo., St. Johns Church	20—268
KFPX	Pine Bluff, Ark., First Presbyterian Church	100—242
KFPY	Spokane, Wash., Symons Investment Co.	100—283
KFQA	St. Louis, Mo., The Principia	50—261
KFQB	Fort Worth, Texas, Searchlight Publishing Co.	100—254
KFQC	Taft, Calif., Kidd Brothers Radio Shop	100—227
KFQD	Anchorage, Alaska, Chovin Supply Co.	100—280
KFQE	Colorado Springs, Colo., Dickenson-Henry Radio Laboratories	10—224
KFQF	Minneapolis, Minn., Donald A. Boult	10—224
KFQG	Los Angeles, Calif., Armory Exposition Park, Southern California Radio Assn.	100—226
KFQH	Hillsbourgh, Calif., Albert Sherman	50—231
KFQI	Culver City, Calif., Thomas H. Ince Corp.	100—234
KFQJ	Oklahoma, Okla., Harbour-Longmire Co.	50—236
KFQK	Fayette, Mo., Democrat Leader	10—236
KFQL	Muskogee, Okla., Oklahoma Free State Fair Assn.	20—252
KFQM	Austin, Texas, Texas Highway Bulletin	100—268
KFQN	Portland, Ore., Third Baptist Church	5—283
KFQO	Russell, Kans., Meier Radio Shop	10—261
KFQP	Iowa City, Iowa, George S. Carson, Jr.	10—224
KFQR	Oklahoma, Okla., Walter L. Ellis	50—250
KFQT	Denison, Texas, Texas National Guard, 36th Signal Company	10—252
KFQU	Holy City, Calif., W. Riker	100—234
KFQV	Omaha, Nebr., Omaha Grain Exchange	100—231
KFQW	North Bend, Wash., C. F. Knierim Photo Radio & Electric Shop	50—248
KFQX	Seattle, Wash., Alfred M. Hubbard	500—233
KFQY	Belden, Nebr., Farmers State Bank	10—273
KFQZ	Hollywood, Calif., Taft Radio Co.	250—240
KFRB	Beeville, Tex., Hall Brothers.	250—248
KFRC	San Francisco, Calif., Radioart Studio, Whitcomb Hotel	5—280
KFRF	Alexandria, La., W. R. Brown	10—242
KFRG	St. Louis, Mo., Cleveland High School	20—236
KFRH	Grafton, N. D., Martin L. Monson	10—263

Reflex Radio Receivers



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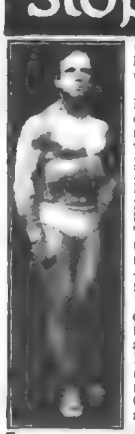

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Call Letters	Location and Name	Power & Wave Length
KFRI	Denver, Colo., Reynolds Radio Co. ..... On moving train in Western Nebraska.	5—224
KFRJ	Conway, Ark., Guy Simmons, Jr.	10—250
KFRL	Grand Forks, N. D., Men's Club of First Presbyterian Church	10—240
KFRM	Fort Sill, Okla., Lieut. James P. Boland, U. S. A.	50—263
KFRN	Hanford, Calif., M. Laurence Short	5—224
KFRO	Fort Worth, Tex., Curtis Printing Co.	50—246
KFSG	Los Angeles, Calif., Echo Park Evangelistic Assn.	500—278
KFSY	Helena, Mont., Van Blaricom Co.	10—261
KGB	Tacoma, Wash., Tacoma Daily Ledger	50—252
KGG	Portland, Ore., Hallock & Watson Radio Service.....	50—360
KGO	Oakland, Calif., General Electric Co. .....1000—312	
KGU	Honolulu, Hawaii, Marion A. Mulrony	500—360
KGW	Portland, Ore., Portland Morning Oregonian	500—492
KGY	Lacey, Wash., St. Martins College	5—258
KHJ	Los Angeles, Calif., Times-Mirror Co.	500—395
KHQ	Seattle, Wash., Louis Wasmer (Excelsior Motorcycle & Bicycle Co.)	100—360
KJQ	Stockton, Calif., C. O. Gould..	5—273
KJR	Seattle, Wash., Northwest Radio Service Co.....	50—283
KJS	Los Angeles, Calif., Bible Institute of Los Angeles.....	750—360
KLS	Oakland, Calif., Warner Bros. Radio Supplies Co.....	250—360
KLX	Oakland, Calif., Tribune Publishing Co.	500—509
KLZ	Denver, Colo., Reynolds Radio Co.	250—283
KMJ	Fresno, Calif., San Joaquin Light and Power Corp.....	50—248
KMO	Tacoma, Wash., Love Electric Co.	10—360
KNT	Kukak Bay, Alaska, Walter Hemrich	100—263
KOB	State College, N. M., New Mexico College of Agriculture and Mechanic Arts....	500—360
KOP	Detroit, Mich., Detroit Police Department	500—286
KPO	San Francisco, Calif., Hale Bros.	500—423
KQP	Hood River, Ore., Apple City Radio Club	10—360
KQV	Pittsburgh, Pa., Doubleday-Hill Electric Co.....	500—270
KQW	San Jose, Calif., Charles D. Herrold	50—360
KRE	Berkeley, Calif., Berkeley Daily Gazette	50—275
KSD	St. Louis, Mo., Post Dispatch.	500—546
KTW	Seattle, Wash., First Presbyterian Church	750—360
KUO	San Francisco, Calif., Examiner Printing Co.	150—360
KWG	Stockton, Calif., Portable Wireless Telephone Co.	50—360
KWH	Los Angeles, Calif., Los Angeles Examiner	250—360
KYQ	Honolulu, Hawaii, The Electric Shop	100—270
KYW	Chicago, Ill., Westinghouse Electric & Mfg. Co.....1000—536	
KZM	Oakland, Calif., Preston D. Allen	100—360
WAAB	New Orleans, La., Valdemar Jensen	100—268
WAAC	New Orleans, La., Tulane University	400—360
WAAD	Cincinnati, Ohio, Ohio Mechanics Institute	25—360
WAAF	Chicago, Ill., Chicago Daily Drovers Journal	200—286
WAAM	Newark, N. J., I. R. Nelson Co.	250—263
WAAN	Columbia, Mo., University of Missouri	90—254
WAAW	Omaha, Neb., Omaha Grain Exchange	500—286
WABB	Harrisburg, Pa., Harrisburg Sporting Goods Co.....	10—266
WABD	Dayton, Ohio, Parker High School	5—283
WABH	Sandusky, Ohio, Lake Shore Tire Co.	10—240
WABI	Bangor, Me., Bangor Railway & Electric Co.	100—240
WABL	Storrs, Conn., Connecticut Agricultural College	100—283
WABM	Saginaw, Mich., F. E. Doherty Automotive & Radio Equipment Co.	100—254
WABN	La Crosse, Wis., Ott Radio, Inc.	500—244
WABO	Rochester, N. Y., Lake Avenue Baptist Church (Hickson Electric Co.)	10—283

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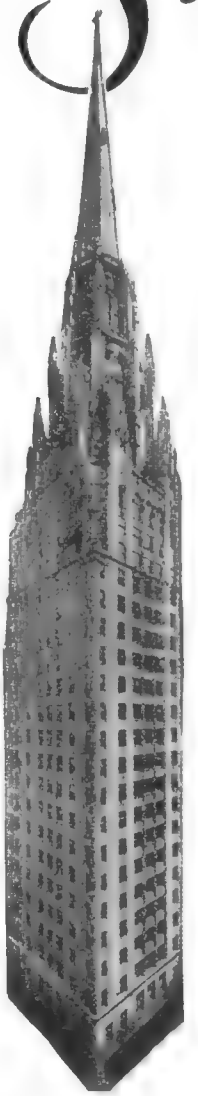

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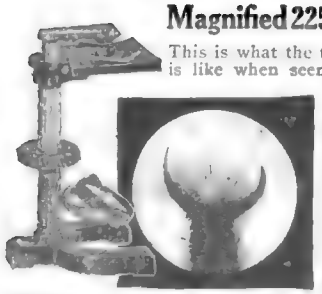

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Call Letters	Location and Name	Power & Wave Length
WABP	Dover, Ohio, Robert F. Weinig	200—266
WABQ	Haverford, Pa., Haverford College Radio Club	50—261
WABR	Toledo, Ohio, Scott High School	50—270
WABU	Camden, N. J., Victor Talking Machine Co.	50—226
WABW	Wooster, Ohio, College of Wooster	20—234
WABX	Mount Clemens, Mich. (near), Henry B. Joy	500—270
WABY	Philadelphia, Pa., John Magaldi, Jr.	50—242
WABZ	New Orleans, La., Coliseum Place Baptist Church	50—263
WAHG	Richmond Hill, N. Y., A. H. Grebe & Co.	500—316
WBAA	West Lafayette, Ind., Purdue University	250—283
WBAN	Paterson, N. J., Wireless Phone Corp.	100—244
WBAO	Decatur, Ill., James Millikin University	50—275
WBAP	Fort Worth, Texas, Wortham-Carter Publishing Co. (Star-Telegram)	1000—476
WBAV	Columbus, Ohio, Erner & Hopkins Co.	500—423
WBAX	Wilkes-Barre, Pa., John H. Stenger, Jr.,	20—254
WBAY	New York, N. Y., Western Electric Co.	500—492
WBBA	Newark, Ohio, Plymouth Congregational Church	20—240
WBBD	Reading, Pa., Barbey Battery Service	50—234
WBBF	Atlanta, Ga., Georgia School of Technology	500—270
WBBG	Mattapoisett, Mass., Irving Vermilya	500—248
WBBH	Port Huron, Mich., J. Irving Bell	50—246
WBBL	Richmond, Va., Grace Covenant Church	5—283
WBBP	Petoskey, Mich., Petoskey High School	100—246
WBBR	Rossville, N. Y., Peoples Pulpit Assn.	500—273
WBBS	New Orleans, La., First Baptist Church	50—252
WBBT	Philadelphia, Pa., Lloyd Bros.	5—234
WBBU	Monmouth, Ill., Jenks Motor Sales Co.	10—224
WBBV	Johnstown, Pa., Johnstown Radio Co.	5—248
WBBW	Norfolk, Va., Ruffner Junior High School	50—222
WBBY	Charleston, S. C., Washington Light Infantry	10—268
WBBZ	Indianapolis, Ind., Noble B. Watson	50—227
WBL	Anthony, Kans., T & H Radio Co.	100—254
WBS	Newark, N. J., D. W. May, Inc.	50—360
WBT	Charlotte, N. C., Southern Radio Corp.	250—360
WBZ	Springfield, Mass., Westinghouse Electric & Mfg. Co.	1000—337
WCAD	Canton, N. Y., St. Lawrence University	250—280
WCAE	Pittsburgh, Pa., Kaufmann & Baer Co.	500—462
WCAG	New Orleans, La., Clyde R. Randall	50—268
WCAH	Columbus, Ohio, Entrekin Electric Co.	100—286
WCAJ	University Place, Neb., Nebraska Wesleyan University	500—280
WCAK	Houston, Texas, Alfred P. Daniel	10—263
WCAL	Northfield, Minn., St. Olaf College	500—360
WCAO	Baltimore, Md., Sanders & Stayman Co.	50—275
WCAP	Washington, D. C., Chesapeake & Potomac Telephone Co.	500—469
WCAR	San Antonio, Texas, Southern Radio Corporation of Texas	100—360
WCAS	Minneapolis, Minn., William Hood Dunwoody Industrial Institute	100—280
WCAT	Rapid City, S. D., South Dakota State School of Mines	50—240
WCAU	Philadelphia, Pa., Durham & Co.	250—286
WCAV	Little Rock, Ark., J. C. Dice Electric Co.	10—360
WCAX	Burlington, Vt., University of Vermont	100—360
WCAY	Milwaukee, Wis., Hotel Antlers, Milwaukee Civic Broadcasting Assn.	250—266
WCBA	Allentown, Pa., Charles W. Heimbach	10—280

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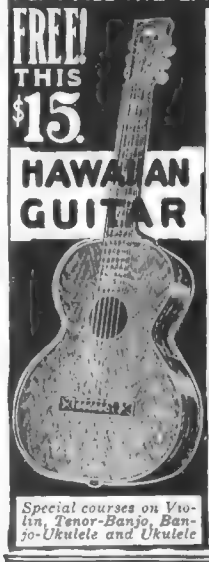

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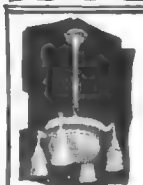

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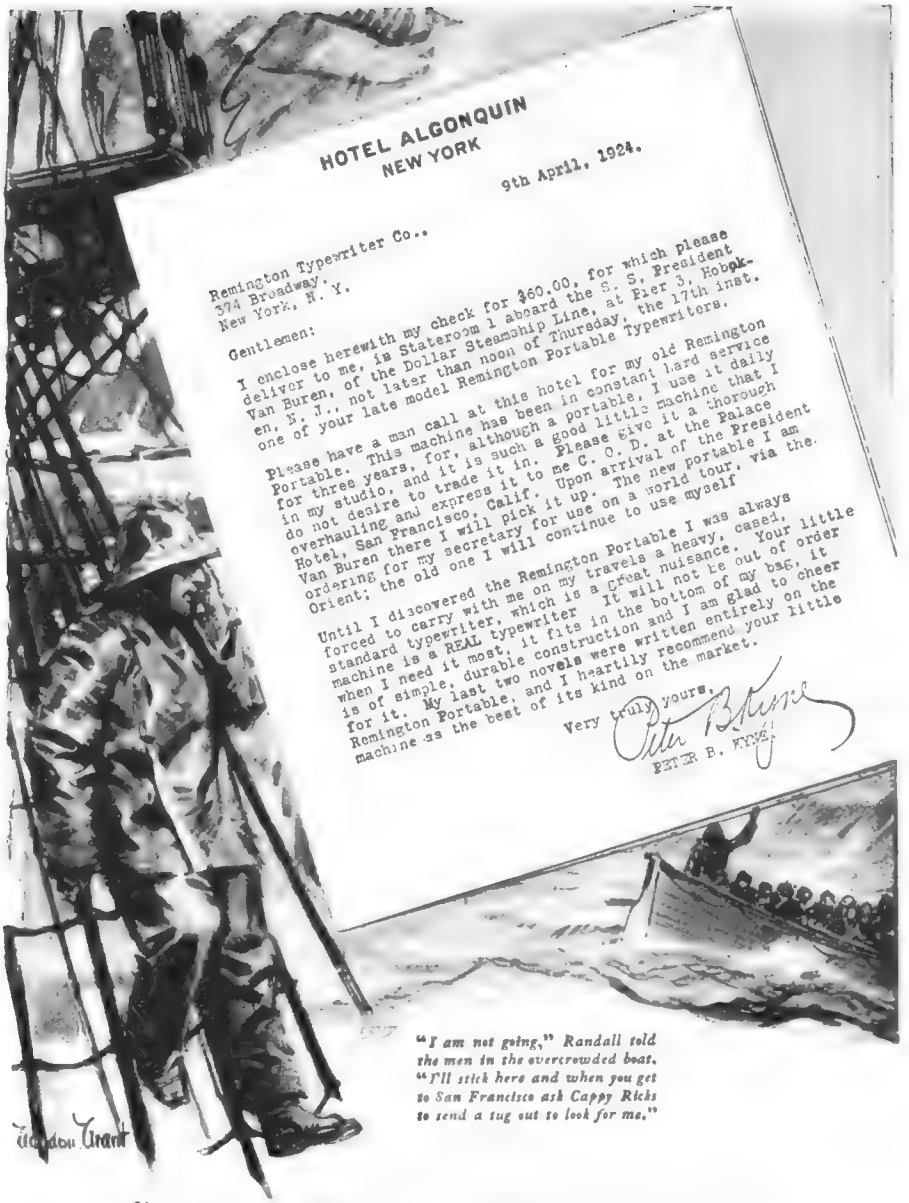
WCBC	Ann Arbor, Mich., University of Michigan	200—280
WCBD	Zion, Ill., Wilbur G. Voliva	500—345
WCBE	New Orleans, La., Uhalt Brothers Radio Co.	5—263
WCBG	Pascagoula, Miss. (portable), Howard S. Williams	10—268
WCBH	Oxford, Miss. (near), University of Mississippi	10—242
WCBI	Bemis, Tenn., Nicoll, Duncan & Rush	50—240
WCBJ	Jennings, La., J. C. Mans	10—244
WCBK	St. Petersburg, Fla., E. Richard Hall	500—266
WCBL	Houlton, Me., Northern Radio Mfg. Co.	50—280
WCBO	Memphis, Tenn., Radio Shop, Inc.	20—250
WCBQ	Nashville, Tenn., First Baptist Church	100—236
WCBR	Providence, R. I. (portable), Charles H. Messter	5—246
WCBT	Worchester, Mass., Clark University	250—238
WCBU	Arnold, Pa., Arnold Wireless Supply Co. (F. J. Ambrose)	50—254
WCBV	Tullahoma, Tenn., Tullahoma Radio Club	10—252
WCBW	Macon, Ga., George P. Rankin, Jr., and Mitland Soloman	10—226
WCBY	Buck Hill Falls, Pa., Forks Electrical Shop	10—268
WCBZ	Chicago Heights, Ill., Coppotelli Bros. Music House	50—248
WCCO	Minneapolis, Minn., Washburn-Crosby Co.	500—417
WCK	St. Louis, Mo., Stix-Baer & Fuller Dry Goods Co.	100—360
WCX	Detroit, Mich., Detroit Free Press	500—517
WDAE	Tampa, Fla., Tampa Daily Times	250—360
WDAF	Kansas City, Mo., Kansas City Star	500—411
WDAG	Amarilla, Texas, J. Laurance Martin	100—263
WDAH	El Paso, Texas, Trinity Methodist Church (South)	50—268
WDAR	Philadelphia, Pa., Lit Brothers	500—395
WDAS	Worcester, Mass., Sam Waite's Radio Shop	10—360
WDAU	New Bedford, Mass., Slocum & Kilburn	100—360
WDAY	Fargo, N. D., Radio Equipment Corporation	50—244
WDBB	Taunton, Mass., A. H. Waite & Co.	10—229
WDBC	Lancaster, Pa., Kirk, Johnson & Co.	50—258
WDBD	Martinsburg, W. Va., Herman E. Burns	5—268
WDBF	Youngstown, Ohio, Robert G. Phillips	50—246
WDBH	Worcester, Mass., C. T. Shear Co.	100—268
WDBI	St. Petersburg, Fla., Radio Specialty Co.	20—226
WDBJ	Roanoke, Va., Richardson-Wayland Electrical Corporation	50—229
WDBN	Bangor, Me., Maine Electric Light & Power Co.	5—252
WDBO	Winter Park, Fla., Rollins College	50—240
WDBP	Superior, Wis., Superior State Normal School	50—261
WDBQ	Salem, N. J., Morton Radio Supply Co.	10—234
WDBR	Boston, Mass., Tremont Temple Baptist Church	100—256
WDBS	Dayton, Ohio, S. M. K. Radio Corp.	5—283
WDBT	Hattiesburg, Miss., Taylor's Book Store	10—236
WDBW	Columbia, Tenn., The Radio Den	20—268
WDBX	New York, N. Y., Otto Baur	5—233
WDBY	Chicago, Ill., North Shore Congregational Church	500—258
WDBZ	Kingston, N. Y., Boy Scouts of America (Ulster County Council)	5—233
WDM	Washington, D. C., Church of the Covenant	50—234
WDZ	Tuscola, Ill., James L. Bush	10—278
WEAA	Flint, Mich., Police Building, Frank D. Fallain	50—280
WEAF	New York, N. Y., American Telep. & Teleg. Co.	500—492
WEAH	Wichita, Kans., Wichita Board of Trade	50—280
WEAI	Ithaca, N. Y., Cornell University	500—286
WEAJ	Vermilion, S. Dak., University of South Dakota	100—283
WEAM	North Plainfield, N. J., Borough of North Plainfield	150—286
WEAN	Providence, R. I., Shepard Co.	100—273
WEAO	Columbus, Ohio, Ohio State University	500—294
WEAP	Mobile, Ala., Mobile Radio Co.	100—360
WEAU	Sioux City, Iowa, Davidson Bros. Co.	100—275
WEAY	Houston, Tex., Iris Theatre	500—360
WEB	St. Louis, Mo., Benwood Co.	100—273
WEBA	Highland Park, N. J., The Electric Shop	15—233


HOTEL ALGONQUIN
NEW YORK
9th April, 1924.
Remington Typewriter Co..
374 Broadway,
New York, N. Y.
Gentlemen:
I enclose herewith my check for $60.00, for which please deliver to me, in Stateroom 1 aboard the S. S. President Van Buren, of the Dollar Steamship Line, at Pier 3, Hoboken, N. J., not later than noon of Thursday, the 17th inst. one of your late model Remington Portable Typewriters.
Please have a man call at this hotel for my old Remington Portable. This machine has been in constant hard service for three years, for, although a portable, I use it daily in my studio, and it is such a good little machine that I do not desire to trade it in. Please give it a thorough overhauling and express it to me C. O. D. at the Palace Hotel, San Francisco, Calif. Upon arrival of the President Van Buren there I will pick it up. The new portable I am ordering for my secretary for use on a world tour, via the Orient; the old one I will continue to use myself
Until I discovered the Remington Portable I was always forced to carry with me on my travels a heavy, cased, standard typewriter, which is a great nuisance. Your little machine is a REAL typewriter. It will not be out of order when I need it most; it fits in the bottom of my bag, it is of simple, durable construction and I am glad to cheer for it. My last two novels were written entirely on the Remington Portable, and I heartily recommend your little machine as the best of its kind on the market.
Very truly yours,
PETER B. KYNE
"I am not going," Randall told the men in the overcrowded boat. "I'll stick here and when you get to San Francisco ask Cappy Ricks to send a tug out to look for me."

"IT'S A REAL TYPEWRITER"

The Remington Portable has won the endorsement of Peter B. Kyne, just as it has won the endorsement of prominent people the world over—by its outstanding superiority. Its success has been phenomenal.

Many present owners, like Mr. Kyne, have operated other typewriters. In the Remington Portable they have found a compact machine which meets every requirement, built to do beautiful work, and possessing every feature common to the big machine, even to the four-row standard keyboard.

Why should you continue to write in the old-fashioned, slow, tedious, long-hand, when with a Remington Portable you can turn out a beautifully clear and legible printed page, with far less time and effort? It's time to buy a Remington Portable. Sold by all Remington branches, and over 5,000 dealers. Easy terms.

Illustrated "For You—For Everybody" will be sent upon request. Address Department 14.

REMINGTON TYPEWRITER COMPANY
374 Broadway, New York City
Remington Typewriter Company of Canada, Limited
Main Office, 68 King Street, West, Toronto

REMINGTON
Portable Typewriter
THE RECOGNIZED LEADER—IN SALES AND POPULARITY

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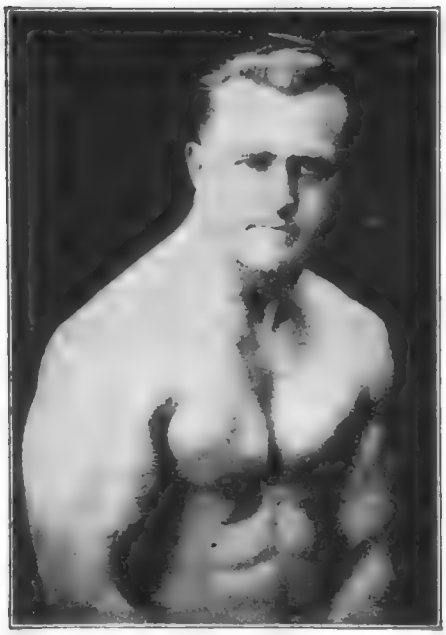

EARLE E. LIEDERMAN
The Muscle Builder

A WART ON YOUR NOSE

would not be noticed nearly as much as a frail, weak body. Yet, if you had a wart on your nose, you would worry yourself sick—you would pay most any price to get rid of it. But what about that body of yours? What are you doing to make people admire and respect you? Wake up! Come to your senses! Don't you realize what a strong, robust body means to you? It makes no difference whether it be in the business or social world—everybody admires the strong, robust fellow—everyone despises the weakling.

I WILL TRANSFORM YOU

I make weak men strong. That's my job. That's why they call me "The Muscle Builder." I never fail. A bold statement, but true. I don't care how weak you are, I can do the trick. The weaker you are, the more noticeable the results. I've been doing this for so many years, it's easy now. I know how.

In just thirty days, I'm going to put one full inch on those arms of yours. Yes, and two inches on your chest. But that's nothing. I've only started. Now comes the real work. I'm going to broaden your shoulders and strengthen your back. I'm going to deepen your chest so that every breath will literally penetrate every cell of your lungs, feeding them with rich life-giving oxygen. You will feel the thrill of life glowing throughout your entire system. I'm going to tighten up those muscles in and around your heart, kidneys and stomach. I'm going to shoot a quiver up your spine so that you will stretch out your big brawny arms and shout for bigger and harder tasks to do. Nothing will seem impossible.

Sounds good, doesn't it? You can bet your Sunday socks it's good. It's wonderful. And the best of it is, I don't just promise you these things—I guarantee them. Do you doubt me? Come on then and make me prove it. That's what I like.

Are you ready? Atta boy! Let's go.

Send for my new 64-page book

"Muscular Development"

IT IS FREE!

It contains forty-three full page photographs of myself and some of the many prize-winning pupils I have trained. Many of these are leaders in their business professions today. I have not only given them a body to be proud of, but made them better doctors, lawyers, merchants, etc. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. All I ask is ten cents to cover the cost of wrapping and mailing and it is yours to keep. This will not obligate you at all, but for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

EARLE E. LIEDERMAN
Dept. 202, 305 Broadway, New York City

EARLE E. LIEDERMAN
Dept. 202, 305 Broadway, New York City.
Dear Sir:—I enclose herewith 10 cents for which you are to send me without obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

Name .....
Street .....
City ..... State .....

Call Letters	Location and Name	Power & Wave Length
WEBC	Superior, Wis., Walter C. Bridges	10—242
WEBD	Anderson, Ind., Electrical Equipment & Service Co...	10—246
WEBE	Cambridge, Ohio, Roy W. Waller	10—248
WEBH	Chicago, Ill., Edgewater Beach Hotel Co.	1000—370
WEBI	Salisbury, Md., Walter Gibbons	15—242
WEBJ	New York, N. Y., Third Avenue Ry. Co.	500—273
WEBK	Grand Rapids, Mich., Grand Rapids Radio Co.	20—261
WEBL	United States, R. C. A.	100—226
WEBO	Hamilton, Ohio, Harry W. Fahrlander	5—250
WEBP	New Orleans, La., E. Budd Peddicord	50—280
WEBQ	Harrisburg, Ill., Tate Radio Co.	10—226
WEBR	Buffalo, N. Y., H. H. Howell	15—240
WEBT	Dayton, Ohio, Dayton Cooperative Industrial High School	5—270
WEBU	De Land, Fla., De Land Piano & Music Co.	5—258
WEBW	Beloit, Wis., Beloit College...	500—283
WEBX	Nashville, Tenn., John E. Cain, Jr.	50—263
WEBY	Roslindale, Mass., Hobart Radio Co.	10—226
WEBZ	Savannah, Ga., Savannah Radio Corp.	5—280
WEEI	Boston, Mass., Edison Electric Illuminating Co. of Boston	500—303
WEV	Houston, Tex., Hurlburt-Still Electrical Co.	100—263
WEW	St. Louis, Mo., St. Louis University	100—280
WFAA	Dallas, Tex., Dallas News & Dallas Journal	500—476
WFAM	St. Cloud, Minn., Times Publishing Co.	10—273
WFAN	Hutchinson, Minn., Hutchinson Electric Service Co.	100—286
WFAV	Lincoln, Nebr., University of Nebraska	250—275
WFBB	Eureka, Ill., Eureka College..	50—240
WFBG	Altoona, Pa., William F. Gable Co.	100—261
WFBH	New York, N. Y., Concourse Radio Corp.	500—273
WFBI	Camden, N. J., Galvin Radio Supply Co.	100—236
WFBJ	Collegeville, Minn., St. John's University	50—236
WFBK	Hanover, N. H., Dartmouth College	100—256
WFBL	Syracuse, N. Y., Onondaga Hotel	100—286
WFBM	Indianapolis, Ind., Merchants Heat & Light Co.	250—268
WFBN	Bridgewater, Mass., Radio Sales & Service Co.	200—226
WFBQ	Raleigh, N. C., Wynne Radio Co.	50—252
WFBR	Baltimore, Md., Fifth Infantry, Maryland, N. G.	100—254
WFBT	Pitman, N. J., Gloucester County Civic League	50—231
WFBU	Boston, Mass., Commonwealth Radio Association	
WFI	Philadelphia, Pa., Strawbridge & Clothier	500—395
WGAL	Lancaster, Pa., Lancaster Electric Supply & Construction Co.	10—248
WGAN	Pensacola, Fla., Cecil E. Lloyd	50—360
WGAQ	Shreveport, La., Youree Hotel	150—252
WGAZ	South Bend, Ind., South Bend Tribune	250—275
WGBA	Baltimore, Md., Jones Electric & Radio Mfg. Co.	50—254
WGBS	New York, N. Y., Gimbel Brothers	1000—316
WGI	Medford Hillside, Mass., American Radio & Research Corp.	100—360
WGL	Philadelphia, Pa., Thomas F. J. Howlett	500—360
WGN	Chicago, Ill., The Tribune (Drake Hotel - Whitestone Co.)	1000—370
WGR	Buffalo, N. Y., Federal Telep. Mfg. Co.	750—319
WGY	Schenectady, N. Y., General Electric Co.	1000—380
WHAA	Iowa City, Iowa, State University of Iowa	500—484
WHAD	Milwaukee, Wis., Marquette University	100—280
WHAG	Cincinnati, Ohio, University of Cincinnati	100—222
WHAM	Rochester, N. Y., University of Rochester	100—283
WHAR	Atlantic City, N. J., Seaside Hotel	100—275
WHAS	Louisville, Ky., Courier-Journal & Louisville Times	500—400

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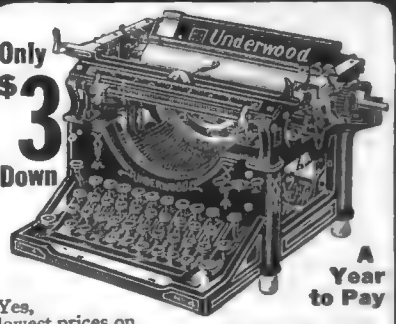

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FARAWAY Radio Sets are amazing values at bargain prices. Users get stations from New York to Frisco—loud and clear. Operate with either dry cells or storage batteries. Beautiful cabinet finished in mahogany with new platinum-finished panel. SATISFACTION GUARANTEED. Don't pay $100 to $150. Write for our *money-saving plan* and literature.

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MAKE MONEY SELL MADISON SHIRTS

Direct from our factory to wearer. Easily sold. Over one million satisfied wearers. No capital or experience required. Large steady income. Many earn $100. to $150. weekly. Territory now being allotted. *Write For Free Samples.*

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Call Letters	Location and Name	Power & Wave Length
WHAV	Wilmington, Del., Wilmington Electrical Specialty Co.	100—503
WHAZ	Troy, N. Y., Rennselaer Polytechnic Institute	500—380
WHB	Kansas City, Mo., Sweeney School Co.	500—411
WHK	Cleveland, Ohio, Radiovox Co.	100—283
WHN	New York, N. Y., George Schubel	500—360
WHO	Des Moines, Iowa, Bankers Life Co.	500—526
WIAB	Rockford, Ill., Art. A. Johnson Garage	50—252
WIAC	Galveston, Tex., Galveston Tribune	100—360
WIAD	Philadelphia, Pa., Howard R. Miller	100—254
WIAK	Omaha, Nebr., Journal-Stockman Co.	250—278
WIK	McKeesport, Pa., K. & L. Electric Co.	100—234
WIP	Philadelphia, Pa., Gimbel Brothers	500—509
WJAB	Lincoln, Nebr., American Electric Co.	100—229
WJAD	Waco, Tex., Jackson's Radio Engineering Laboratories ..	150—360
WJAG	Norfolk, Nebr., Norfolk Daily News	250—283
WJAK	Greentown, Ind., Clifford L. White	30—254
WJAM	Cedar Rapids, Iowa, D. M. Perham	20—268
WJAN	Peoria, Ill., Peoria Star.....	100—280
WJAR	Providence, R. I., The Outlet Co.	500—360
WJAS	Pittsburgh, Pa., Pittsburgh Radio Supply House	500—286
WJAX	Cleveland, Ohio, Union Trust Co.	500—390
WJD	Granville, Ohio, Denison University	10—229
WJJD	Mooseheart, Ill., Supreme Lodge, Loyal Order of Moose	500—278
WJY	New York, N. Y., R. C. A..	750—405
WJZ	New York, N. Y., R. C. A..	500—455
WKAA	Cedar Rapids, Iowa, H. F. Paar	50—278
WKAD	East Providence, R. I., Charles Looff (Crescent Park).....	20—240
WKAF	Wichita Falls, Tex., W. S. Radio Supply Co.	100—360
WKAN	Montgomery, Ala., United Battery Service Co.	15—226
WKAP	Cranston, R. I., Dutee W. Flint	50—360
WKAQ	San Juan, P. R., Radio Corp. of Porto Rico	500—360
WKAR	East Lansing, Mich., Michigan Agricultural College	500—280
WKAV	Laconia, N. H., Laconia Radio Club	50—254
WKBF	Cranston, R. I., Dutee W. Flint	500—286
WKY	Oklahoma, Okla., WKY Radio Shop	100—360
WLAL	Tulsa, Okla., Naylor Electrical Co.	100—360
WLAP	Louisville, Ky., W. V. Jordan	20—286
WLAX	Greencastle, Ind., Greencastle Community Broadcasting Station	10—231
WLBL	Stevens Point, Wis., Wisconsin Department of Markets...	500—278
WLS	Chicago, Ill., Sears, Roebuck & Co.	500—345
WLW	Cincinnati, Ohio, Crosley Radio Corp.	1000—423
WMAC	Cazenovia, N. Y., Clive B. Meredith	100—261
WMAF	Dartmouth, Mass., Round Hills Radio Corp. .....100—	500—360
WMAH	Lincoln, Nebr., General Supply Co.	100—254
WMAK	Lockport, N. Y., Norton Laboratories	500—273
WMAN	Columbus, Ohio, First Baptist Church	50—286
WMAQ	Chicago, Ill., Chicago Daily News	500—448
WMAV	Auburn, Ala., Alabama Polytechnic Institute	500—250
WMAY	St. Louis, Mo., Kingshighway Presbyterian Church	100—280
WMAZ	Macon, Ga., Mercer University	100—261
WMC	Memphis, Tenn., "Commercial Appeal"	500—500
WMH	Cincinnati, Ohio, Ainsworth-Gates Radio Co.	750—309
WMU	Washington, D. C., Doubleday-Hill Electric Co.	100—261
WNAC	Boston, Mass., Shepard Stores	100—278
WNAD	Norman, Okla., University of Oklahoma	100—254
WNAL	Omaha, Nebr., Omaha Central High School	20—258
WNAP	Springfield, Ohio, Wittenberg College	100—275
WNAR	Butler, Mo., First Christian Church	20—231

Will you give me 6 Months to Increase YOUR PAY?

Your name on the coupon means "Yes"

No, I am not a wizard. I don't claim to have a "corner" on success, but here's a fact.

For fourteen years I have been helping men just like you to make more money, not just a few men here and there, but thousands of men.

Think these facts over—in just a few months time I boosted one man's pay from $2.00 a day to over $300 a month—another now makes as high as $27.00 a day—another man, after securing my help, went into business for himself and, while he now hires his drafting done, he makes over $50,000 a year.

$275 Extra in Three Days

One man saw an ad like this—Sent in the coupon—Enrolled for the Columbia Course—and shortly after he received $275 for one drawing that he made in his spare time in three days.

Do you make money like these men do? Does the money in your pay envelope get you the things you really want or just enough to make you wish you, too, could have the good things of life that other men have—money, independence, success, happiness?

MAKE $50 TO $100 A WEEK

Columbia will train you to be an expert Draftsman in your spare time at home by mail. There's a lot of room for you if you act now. This doesn't mean that you will be just an ordinary Draftsman, but a finished, Professional Draftsman, able to hold your place among the highest paid Draftsmen in the land.

PROMOTION IS QUICK

We'll qualify you for a high salaried position in the Drafting field and keep you in touch with openings for Draftsmen in the big machine shops, industrial plants and United States Government departments. Men who start as Draftsmen are often advanced to Chief Draftsmen, Chief Engineers, Production Managers, and so on. Many of my graduates are today holding such positions as a result of my help. These positions pay big money and lead on to executive positions of the highest type. Thousands of men have found Drafting to be the stepping stone to some of the biggest positions in American industry.

GET THE RIGHT TRAINING

I started this school years ago. Today it is a solidly established nationally known institution, with graduates all over the world. I stand personally in back of the Columbia School of Drafting and back of every promise, every statement we make.

You get the right training when you enroll at Columbia. You spend no time on long winded theories. You start on actual drawing work the day you receive your first lesson. You get right down to brass tacks and there is no lost motion, no waste time or effort at any stage of the course. From the very beginning you can feel yourself making progress, the kind of progress that makes you confident of yourself and sure of your success.

YOU NEED NO PREVIOUS TRAINING

This course of mine is easy to understand and easy to follow. It is designed for men who must have the best and who must get the right training quickly, so as to be able to make more money as soon as possible. Many of my students are qualified, even before they complete the course. Many a man has increased his pay so soon after enrolling that his course has actually cost him nothing.

SUCCESS CALLS MEN OF ACTION ONLY

If you are a man of action—if you want success bad enough to reach out and grab it, clip the coupon now and show me that you are a man of action. Keep right on top of this opportunity to make real money. Don't go looking for a pair of scissors, tear the coupon off and mail it right away. Get started now.

What I Give You

Free Book. Send in the coupon today. I will immediately send you our book "Drafting—Your Success" which tells about Drafting and its opportunities and contains proof that I can raise your pay.

Free Subscription to Drafting Publication, "The Compass." I will give you free a subscription to our helpful, inspiring publication, "The Compass."

Practical Problems. You will be carefully coached in practical Drafting work.

I Help You Get A Job. I will help you get a position as a practical Draftsman and will give you real, personal help, such as I have given to thousands of others.

Personal Instruction and Supervision, throughout the Course. You will receive the personal instruction and help of Roy C. Claflin, President of the Columbia School of Drafting and a practical Draftsman of many years' experience.

Draftsman's Equipment. I will furnish you with a full set of first class drawing equipment and Drafting instruments, as shown in the picture below, when you enroll. You keep both sets on completing the course.

Consultation Privileges. You are free to write me at any time for personal advice and suggestions regarding your progress.

Diploma. The diploma I will give you on completing the course attests to your proficiency as a Draftsman. It is an entering wedge to success.

Advice Regarding Government Positions. The following are a few of the many positions open in the Government Departments from time to time. The salaries are **starting** salaries, subject to increase:

Architectural Designer — $4,000 a year.
Chief Draftsman, Naval Aircraft Factory—$15.04 a day.
Aeronautical Draftsman, Field Service Navy Department — $5.20 to $12.50 a day.

We will advise you as to other government openings from time to time.

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BIG FREE BOOKLET tells the story. California users of CROSS COUNTRY CIRCUIT hear Atlantic Coast, Canada, Cuba, Mexico and Hawaii. Atlantic Coast users hear England to California. Our new plan makes this set easiest and cheapest to build. One hour puts in operation. One tuning control. No soldering. Any novice can do it. BIG BOOKLET FREE or complete instructions for 25c stamps or coin.
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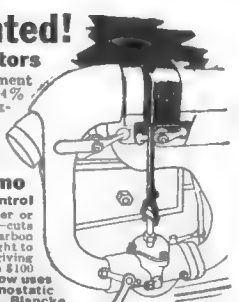
to use and introduce attachment that makes Fords run on 94% air. THERMOSTAT on exhaust automatically turns down needle valve as engine warms, exactly as Ford Manual says do by hand.



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An Automatic Carburetor Control

Makes Fords start easier winter or summer—saves half gas and oil—cuts repair bills one-half—reduces carbon formation one-half. Sells on sight to every Ford owner as easily as giving him a $100 bill, because it saves $100 every 10,000 miles. Cadillac now uses as standard equipment thermostatic carburetor control under Blancke license. You can make Big Money selling this wonderful proven device. Experience not necessary. Blancke plan will start you without capital in a business of your own that makes you from $250 to $2,000 a month profit.

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It's Easy TO PLAY and to PAY

For a BUESCHER True Tone Saxophone

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Free Trial - Easy Payments

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Free!

This beautiful book shows how easy it is to learn to play a Buescher. In it you will find the first lesson chart. It shows all the different models and tells what each is used for.

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Mention Any Other .....
Write plainly, Name, Address, Town and State in Margin Below

The Living Death

By JOHN MARTIN LEAHY

(*Continued from page* 987)

tain, to hear the rest of your story. Did you find anything else at that cave or in it?"

"We did, *in* it, as you shall soon see.

"We had come prepared (so I thought) to explore it, and at least we started in. For the first few yards, the roof was so low that we could not go upright. Then suddenly the walls drew apart and the roof went sloping up to form a great vault. There was now no ice underfoot or anywhere. The place grew larger and larger as we advanced until at last, standing in the middle point, we could barely make out the wall on either side. It was a strange, weird scene, and it gave a man some solemn thoughts to be entering this place which human foot had never trod for so many thousands of centuries.

"I was carrying the light, and I had stopped and raised it high above my head in order to get a good look roundabout when a sharp exclamation broke from Hampden. I looked, and I think that I exclaimed, too. At any rate, I know I started and a strange feeling came over me. There, off to the right and some distance ahead, were two burning eyes, gleaming in the darkness with a greenish, hellish fire.

"Even as my look fell upon them, their dull fire faded; then suddenly they had vanished.

"'The light!' said Hampden. 'Raise the light again!'

"I did so, and there were the two eyes burning once more.

"Hampden laughed.

"'Only the light shining on patches of mineral.'

"'Of course,' I said, moving towards them. 'At first I thought—but there can be no *live* thing in this place.'

"'Hardly,' Hampden laughed.

"We had gone some distance when I stopped again.

"'We had better be careful,' I told him.

"I pointed back towards the entrance, or in that direction in which I thought the entrance ought to be, for we were now encompassed by pitchy darkness.

"'We don't want to get lost in this hole.'

"Hampden treated this suggestion lightly.

"'Not much danger of that,' he told me.

"But I was not so confident on that score.

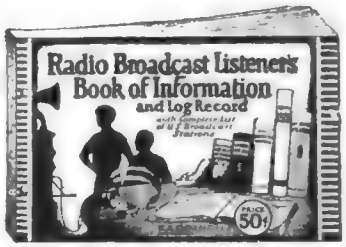
"'See,' I remarked, 'how the things send out arms in all directions.'

"Some of these were so large that I didn't know whether we were following the main cavern or not. Hampden, though, said that there was no ground for uneasiness, and so we went on, slowly but steadily, deeper and deeper into this strange and awful place.

"The temperature of the cavern had risen in a remarkable manner, how much we had no means of knowing, for we had no thermometer with us.

"I clearly perceived that a thorough exploration of this great cavern was, at the present time, simply impossible; we had not come prepared for that. And what would a thorough exploration bring to light? A man could not even imagine that. The Antarctic had turned so many theories and beliefs upside down and inside out* that

* "The temperature of the sea-water is all the year round several degrees lower than the freezing point of fresh water, yet the growth of animal life is so vigorous that at moderate depths the entire bottom is covered and hidden under a dense carpet of rooted animals, and among these hunt and grub great numbers of active and predaceous fish and other locomotive animals. And all the time the temperature of their bodies is just about that of the water in which they live; that is to say, they are below freezing point, a temperature which has been supposed to be fatal to all life."—*Antarctic Days*, Murray and Marston.



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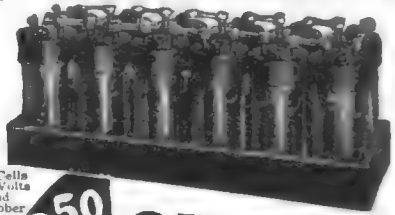

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there was no telling what might be found here.

"Certainly I never imagined anything so strange as what we did find.

"The credit goes to Hampden, poor fellow. For I had come to a stop, my mind made up to turn back at that point.

"'Just five hundred feet more,' said Hampden.

"'Not another inch,' I told him.

"But Hampden was a persistent fellow, and the result was that he got his five hundred feet.

"'One hundred and seventy paces,' said I. 'Unless we find something then, not a foot farther. This place is like an oven.'

"'One hundred and seventy,' said Hampden. 'And here's the first.'

"I never saw longer paces in all my life. I believe Hampden's legs must have been made of rubber.

"At last came the hundred-and-seventieth stride—I believe Hampden had managed to make it eight hundred feet—and there we halted.

"'Well,' I queried, 'satisfied now? Here we are, and we have found nothing.'

"Hampden did not answer. I found his eyes fixed on a point ahead and at some distance above the cavern floor. I looked, too. I could see nothing but a black mass of wall, but that was because a moment before the light had shone in my eyes.

"'Oh, Lord,' exclaimed Hampden, 'look at that!'

"A form took shape up there on that black mass of wall—a figure vague, monstrous, horrible.

"For some moments we stood there staring. The light that struggled to it was so feeble, however, that we could not be sure just what that thing was which we saw.

"We moved slowly on towards it.

"'A bat!' I exclaimed.

"'No!' said Hampden, whose eyes were better than mine. *'A harpy!'*

"I fetched up in my tracks, and a shiver went through me.

"'Again!' Hampden cried.

"'I wonder why a harpy,' I said. 'That thing at first gave me the creeps.'

"A few moments, and we were within five or six yards of the wall. There we halted and stood gazing up at the sculptured monster. The figure, cut out of the living rock, was a colossal one, being thirty feet in height and fully fifty in width. It was perched upon a heap of (sculptured) human skulls, the wings were outspread as though it was about to launch itself down upon us, and the expression of the face (a face of striking but repellant beauty) was fierce and terrible beyond all description.

"What was that? I blinked and looked again. That carven horror up there above had held our look; we had seen nothing else. But now I saw it.

"There, right before our eyes, right under that carven monster, was—a door!"

CHAPTER XVI

DEATH TAKES HIM

"As we moved toward it, Hampden said:

"'I see now what that harpy was for.'

"I stopped and looked at him.

"'What was it for?'

"'To warn people to keep away—to keep out.'

"I laughed.

"'It probably worked in those old superstitious days; but it will take more than that harpy up there, horrible though it is, to keep me out.'

"'I think, though,' said Hampden, 'that the door will.'

"And it did. The entrance we found about four feet in width by seven in height and closed by a mass of solid rock. That this stone was a door and not a sealing slab, we both believed. But how did it work?

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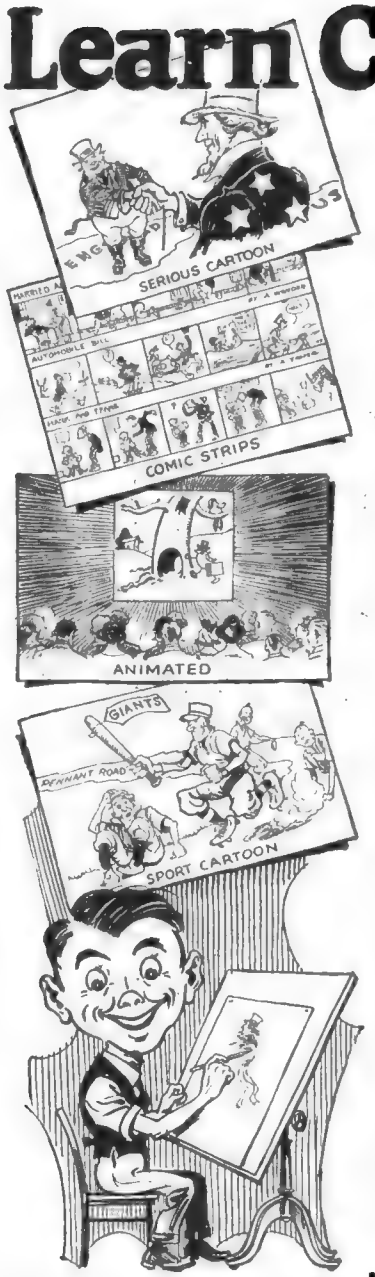

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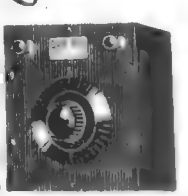

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We pushed and shoved and threw ourselves against it, but it never budged.

"'A man might as well try to move Mount Rainier,' Hampden said.

"'And no doubt,' I remarked, 'a fellow could open it with a push of his little finger—if he only knew the secret.'

"'Of course,' said Hampden, 'but we don't know it.'

"'We might find the secret.'

"We made a long and careful search all around, but at last we had to give it up in despair.

"'What on earth,' Hampden said, 'is on the other side of that door?'

"That is a question I have asked myself a thousand times since. What secret has that harpy been guarding there in that awful darkness through all those ages. What will that man see who at last moves the stone slab and enters the passage? The answer I shall never know. But I believe, Mr. Frontenac, that on a day you will know it.

"And that is what we found, and we found nothing more, there in Sleeping Beauty's Cavern.

"Nothing daunted by this close call, for it really was that, Hampden was anxious to go in again; but I wouldn't hear of it.

"'Why,' Hampden cried, 'there is no telling what else there is in that cave!'

"'That is very true,' I told him; 'but what we want to do is not to run any risks but to get our story to the world.'

"Hampden was terribly put out about it; but I remained firm and adamant.

"We were nearing Depot Number One when it happened. The sky was dark and gloomy, but Hampden and I were in gay spirits. Certainly the prospect seemed a bright one. A few days more, and we would be back at Summer Haven. And then it came, like a bolt from out the blue, and I was left all alone, a man shaken and wretched.

"Hampden was leading. The surface seemed almost level and firm as a floor, and we were swinging along at a smart pace. My look was not upon him at the instant it happened. There was a cry, and I looked up and saw Hampden make a wild effort to turn and save himself, the rear end of the sled tip up, and the sled slip forward and vanish, dragging the dogs down after it. For an instant I thought that Hampden had gone down, too. But no, there he was clinging to the edge of the crevasse and crying wildly for help.

"I rushed forward. I saw with horror that Hampden was slipping, that he was sinking lower and lower. The snow and ice that he was clinging to were giving way. Would the edge hold till I reached him? I got to within thirty feet of him, and then it broke. One loud, terrible cry was heard, then utter silence—or, if any other sound came up from that frightful place, I was not aware of it in the horror of that moment.

"I went to the edge and looked down—into an abyss that seemed fathomless, from which not the faintest sound came up.

"I cried out Hampden's name and cried it again and again, but never any answer came—never the faintest sound.

"How long I stayed there, I do not know. It is an awful feeling to have a man snatched from you like that—a feeling that I hope to God neither of you will ever know.

"At last, however, I left that cursed spot, and I did not make camp until I had reached the depot, nearly twenty miles distant from the scene of the tragedy.

"And that is why I have no photographs of the Gardens of Paradise or of Sleeping Beauty to show you. All had been on Hampden's sled, together with that piece which we had broken off the sculptured pillar, and now all were gone.

"There is little more to tell. It was awful

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making my way through that terrible loneliness, but there was one consolation: I would soon be *home*.

"It would be impossible to describe the joy that I felt when at last I gained the summit of the ridge to the north of Mount Theodore Roosevelt and Mount Woodrow Wilson and looked down on Summer Haven.

"There, far away, was the hut and the *Multnomah* moored in her little cove. For some time I stood there looking upon that strange and familiar scene. Everything was so peaceful, so dreamy and lovely. It was a joy to see the old place again, and yet I knew sorrow too as I stood there and gazed upon it, for, of the brave and loyal men who had gone with me into the Unknown, not a one was with me now.

"Many thoughts came to me as I stood there and not a few questions that I wished could be answered. Well, *some* of them would be answered when I reached the hut. So I spoke to the dogs, and once more we were in motion.

"I had got within a quarter of a mile of the hut before they discovered me. There was a great waving of arms and some cheering, and they started towards me.

"'Where are the others?' was the first question they asked.

"I started to tell them. And now I saw for the first time that thing which was to embitter the rest of my days. Never could I forget that look which came to their faces when I mentioned the palm-trees. I had, of course, often wondered how my story would be received. I had never blinked the fact that there would be difficulties; but now, for the first time, I fully saw what really awaited me. The realization came with something like a shock. I had counted on the photographs removing any doubt that might linger. But there was not a single photograph to show them; all had been lost with poor Hampden.

"Not a word did I say about Sleeping Beauty, or the cave, or that mysterious door over which that carven horror holds its eternal vigil; but I did try to give them a plain, accurate, convincing account of all the rest. It was not long, though, before I saw clearly that the effort was useless. Instead of overcoming their incredulity, I was, it was very clear, only strengthening their conviction—formed at the very first—that what I had gone through had turned my brain.

"At length they began to *humor* me. That was too much and the bitterest of all, and I gave up in anger and fierce despair.

"The rest you know, or you can easily imagine it.

"And so now my story is done. What is to follow, no living man can say; and I shall never know it. But I do know that you will see wonderful things, and terrible ones too in all likelihood, before the word finis is written.

"I pray God to watch over you, Mr. Frontenac, and bring you safe through it all!"

CHAPTER XVII
THE "MULTNOMAH" SAILS

"Well, Bond," said Darwin Frontenac as we seated ourselves after seeing Captain Livingstone into his car, "what do you think of it?"

"No man ever told a stranger story—if, that is, what he told us is true."

"It is true, Bond."

"Do you mean to tell me you believe that that girl, incased in solid ice—if there is such a girl at all—is alive?"

"No."

"Then why——?"

"Just a moment," said Frontenac, uplifting a finger. "What I said was that I do not actually believe that she is alive. That, however, is not tantamount to saying that I believe she is dead. No man can say whether she is or is not. What I do be-

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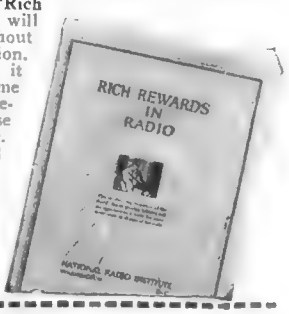

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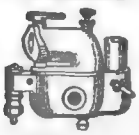

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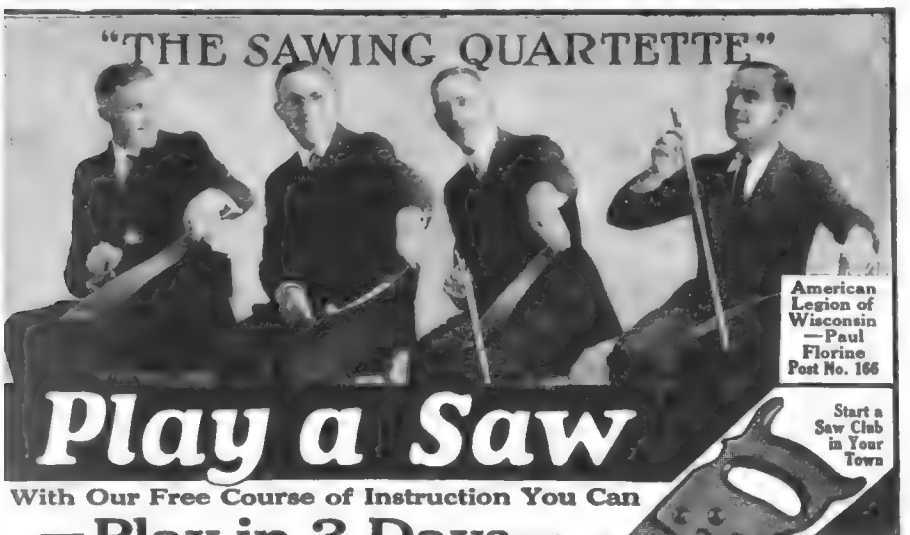

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lieve is simply this: that it is very probable indeed that the poor thing is not dead."

"And you believe that you can awake her?"

"I have every reason to feel confident that such will be the result—that is, supposing always that she be not dead."

"After all these thousands of years!" I exclaimed. "One hundred, two hundred, three hundred thousand years! But how do we know, after all, that she has been there for so many ages, that she has been lying there ever since the Great Cold fell?"

"We don't *know* it but I think we shall find Captain Livingstone's inferences fully justified. We know that thousands upon thousands of years have rolled over this old globe of ours since the snow and ice gathered about the Poles. We know that the climate there was a warm one in Miocene times; therefore the cold must have fallen in the Pliocene. That it came suddenly, instantaneously, as the captain (with the great Cuvier) believes it did, is a matter upon which one may be permitted to entertain some doubts. On the other hand, certain considerations incline me to the belief that the captain may be right. But the point is simply this: Sleeping Beauty could not have lived there *after* the land was mantled in snow and ice; ergo she must have been there *when* that awful curse fell upon the Antarctic."

"Unless," I proffered, "the Gardens of Paradise once extended much farther than they do today and some of the survivors of the awful cataclysm had sought a refuge there."

"I thought," said Frontenac, "that that would be your suggestion. I think it unlikely, though, that such was actually the case. I incline to the belief that, instead of being much larger, the Gardens of Paradise were at one time even of less extent than they are today. For the cold of the Antarctic, bitter though it is now, was once far more terrible."

"We must wait—wait until you awake the sleeper."

"Until I awake the sleeper!" he murmured.

He turned his face towards me, and never shall I forget that look which I saw upon it.

"Bond," said he, "I wonder, supposing that I do awake her—I wonder if she will thank me for it or live to curse both me and the hour."

I remained silent, wondering.

"But," he added, "we should regard the matter in its purely scientific aspect, and then we find it one of extraordinary interest, to say nothing of its possibilities. Sentiment is all very well in its place—as are thorns and roses."

"Why the gloomy thoughts?" I queried. "Why so suddenly look at the dark possibilities? Remember, you may awake for some man a sweetheart—perhaps, indeed, your own fond lover."

Frontenac smiled at that, and then he laughed a little.

"I always knew that you were a poetical son of a gun, Bond, where the ladies are concerned, but I never dreamed you had it so bad as that."

"Well, now," I replied, "looking at the matter in a sober light, what is there so terribly romantic, so terribly poetical, so awfully absurd in my suggestion? The girl is young; she is (if the captain's eye is to be trusted) a very lovely Sleeping Beauty indeed; and do you think for a moment that there will be no lover?"

"I think that the lover will come. Oh, I know that—just as well as I know that it won't be I."

"Oh, indeed! Just wait till you awake her, wait till you see her a living, breath-

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ing woman in all the charm of her loveliness."

He smiled a little but made no response to this. What he said was:

"Do you know, Bond, what, in all the captain's strange story, gave me the greatest surprise?"

"The palm-trees?"

"The palm-trees? Fiddlesticks! Come again," said Frontenac. "And that reminds me: did you know that Nordenskjold thought he might find an oasis in the heart of Greenland?"

"I didn't know that."

"Well, he did."

"Did any scientist ever look for icebergs in the Sahara? But to come back. The severed head of Wilkie—and the mark of that enormous claw?"

"Once more," said Frontenac.

"Sleeping Beauty herself?"

"Not even Sleeping Beauty herself."

"What a queer way you have of looking at things! Then it must have been that mysterious door there in the cavern?"

"You're a mighty good guesser, Bond."

"What on earth was it?"

"His telling us that he had fallen in love with that girl!"

"A strange love certainly," I said.

He was silent for some moments, then asked:

"Going to go with me to get Sleeping Beauty, Bond?"

"I must think the thing over."

"Of course. But I fancy I know what your answer will be."

"This thing you're entering upon," I reminded him, "isn't going to be a honeymoon."

"I haven't forgotten that. A honeymoon is only the end of a dream, but this—this," said Darwin Frontenac, "is the find of a century. And the captain got only a glimpse, so to speak. There is no telling what other things may be down there."

"That is very true. I'm not particularly anxious, though, to get decapitated."

"The mystery," he smiled, "makes the adventure—well, piquant."

"Piquant? Heaven help us!"

"Well, 'tis so," said Frontenac. "And the risk gives it pep."

"Pep? I think you'll call it something else when that thing in the palm-trees starts work on your jugular."

He smiled faintly, but he made no response; a silence ensued.

Of course, he could get Sleeping Beauty without running *that* fearful risk; but I knew better than ever to make such a suggestion to Darwin Frontenac!

Why is danger, mystery the fascinating thing it so often is? I have often wondered about it but never have found any real explanation. It doesn't matter how terrible, how horrible it may be, there are always men simply *crazy* to go. Its subtle, fierce power enshadows the fascination even of woman: sweethearts, wives are left behind, and with glad hearts the men go forth, in their ears (and hearts) the sweet, terrible song of the siren.

Why do they go? I wish I knew!

And I ought to know, too, for (though there was neither sweetheart nor wife in my case) I am one of those fools myself!

The next day Frontenac and I, accompanied by Captain Livingstone, went to see the *Multnomah*. It was about half past nine when we arrived at Pier R, on the south side of which the famous ship was lying. A few moments, and we had issued from the warehouse and the whole of the vessel was in view. I say the whole of the vessel, but this (with the usual point of view in mind) is not strictly correct, for the tide was low, and we were looking not at the *Multnomah* but down upon her decks.

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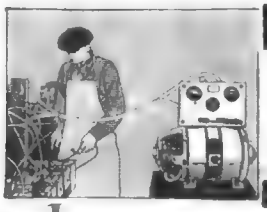

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The Living Death

(*Continued from page* 1055)

"The confounded bag-pipe on two legs!" he exclaimed. "Can you imagine how so shrewd a fellow as Bukink sometimes shows himself to be, can be such a colossal, unmitigated, infernal fool?"

I couldn't.

"But," I queried, "what does it matter? He can never guess the truth."

"I wasn't thinking of that," said Frontenac.

Swiftly the days passed, and nearer and nearer drew the day of sailing. Once we motored up into the mountains to see the dogs. The captain had sent the animals to a high altitude, nearly five thousand feet, to save them as much as possible from the summer weather. Up there we met Mr. Louis Louisiana, known as Nunatak—he with the one eye blue and the other eye black.

It was about a week before the *Multnomah* sailed that I got (after a manner of speaking) the surprise of my life.

"It has been my opinion all along," Darwin Frontenac told me, "that the expedition ought to have a scientist along—to study things geological and biological."

"And so," said I, wondering at that pause of his, "you have got a biologist and a geologist?"

"No. I have been more fortunate: I have got a biologist and geologist."

"Oh! Killing two birds with one stone. And the accomplished gentleman is who?"

"Professor Archimedes Bukink."

"What?"

"Just so," smiled Frontenac.

"But—that is, I thought—great Jupiter Ammon, after all the things you've said, after all the names you have called that man! You said he was a fool, an ass, a nincompoop, a bonehead, a fuddle-cap——"

"I did. I said he was all that and more, and I say it again."

"And yet——"

"And yet," said Frontenac, "Archimedes Bukink is anything but a fool when it comes to geology and biology."

"But the man's utter lack of discretion?"

"I haven't forgotten that, Bond. We must guard against it, that is all. We mustn't let the old calliope know things—things, that is, that we don't want advertised from the house-tops."

"Well, what on earth will it be next? But isn't Bukink getting up in years?"

"He's far from senile yet. No, his years won't matter. He'll encounter no hardship, anyway; his habitat will be Summer Haven. And, besides (though, of course, a man doesn't want cripples along in an enterprise like this) I incline to the captain's belief that, when it comes to these things, the wonders of youth have been not a little exaggerated."

"It may be so. I hope your choice will not turn out a bad one."

"Furthermore, Bond, I am really greatly indebted to Granny Bukink—though I would never, never tell him so."

"Indebted?"

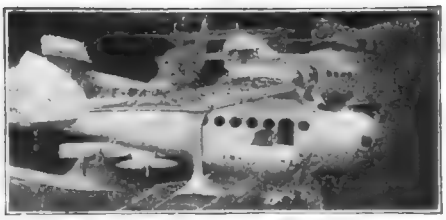
"Just so. For look you! Had it not been for Archimedes, I should, in all likelihood, never have heard the captain's story!"

"And, in all probability," I could not help saying to myself, "we'll wish, every one of us, before this wild business is ended, that you never had!"

On the fourteenth day of the month (September) Nunatak arrived with the dogs. The next day the animals—splendid creatures, every one of them—were *killed* and piled up in the freezer, to be thawed out and resuscitated on our arrival at Summer Haven.

There were one hundred dogs—one hundred and two, to be precise—but the *killing* was not a long affair. Frontenac stood at the entrance to the freezing-room and, as a

(*Continued on page* 1059)



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Gentlemen—Enclosed you will find **Two Dollars** ($2.00) for charter Membership fee in **The Radio Union, Inc.**

I understand this payment entitles me to a **Life Membership** and to a discount on every purchase I make in a membership store, list of which you will forward.

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The Living Death

(*Continued from page* 1057)

dog was brought forward, he made an injection in the animal's neck. On the instant, down it dropped, as though a bullet had gone crashing into its brain. Without more ado, the animal was lifted up and taken inside, and another dog was brought forward. And so it went, almost with the regularity of clock-work. Dog after dog received his injection—the fluid used was a vivid scarlet—down he dropped, to all appearances as dead as a doornail, was piled up in the refrigerator, and another followed.

It was a strange sight—a terrible thing to see. It gave Nunatak quite a turn, especially when he went into the freezing-room after the *killing* was over and saw the frozen bodies piled up one on top of another, the eyes fixed in a glassy, horrible stare.

"The poor brutes!" said Nunatak, unable to keep the tears from those strange eyes of his. "You've fixed them now!"

"They're all right," Frontenac assured him. "They are only sleeping, so to speak. And they'll be fixed so that the pitching of the ship, however violent, cannot budge them."

"Sleepin'!" echoed the musher. "Yes, they're sleepin'—sleepin' the sleep that we'll all find ourselves in some day. Sleepin'! Yes, they're sleepin'. They're dead, that's what they are, every one of them, dead as so many pickled mackerel, as you'll find when you try to wake them up. I guess I know a dead dog when I see one!

"Lord help us!" he added. "What is this here old world of ours comin' to, anyway?"

The next day, at ten minutes to five in the afternoon, the last line was cast off, and the *Multnomah* began to back out into the fairway. A great crowd had gathered, and we certainly received a rousing send-off. Even the face of Captain Livingstone lighted up. This, however, was but for a few moments. A black cloud suddenly cast its shadow across his features.

A few moments, and we had cleared the pier and were out in the stream. The engine was reversed; the *Multnomah* lost sternway, stood still for a few seconds, then began to move forward. The ship's head swung away, over until we had the West Point light a point or two on our starboard bow, when the helmsman steadied the wheel and held her there.

We were off—off at last on our strange quest! How strange that quest really was, only three men knew—*thought* they knew.

Sunrise found us off the Dungeness light, with all canvas set (save the square foretopsails) and the wind on our starboard beam. The motor was still going, however, for the wind was a light one. But, as the day advanced, it increased to a fresh breeze, when the engine was stopped and we went along under canvas alone, the ship slowly rising and falling now to the long swells coming in from the sea.

(*To be continued*)

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Astronomy is 1derful,
And interesting 2.
The earth 3volves around the sun
Which makes a year 4 you.

The moon is dead and can't re5
By law of Phy6 great,
It's 7, where the stars above,
Do nightly scintil8.

If watchful Providence be9,
With good in10tions fraught,
Did not keep its grand design
We should come to 0.

GEO. GRAY.

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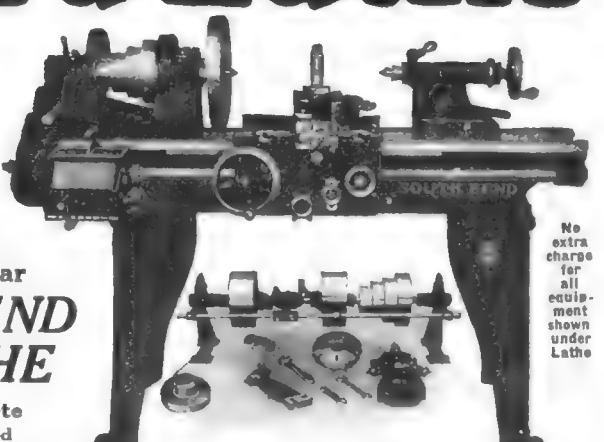

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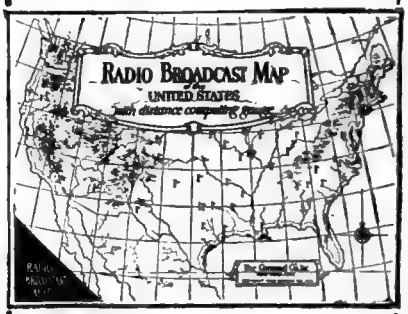

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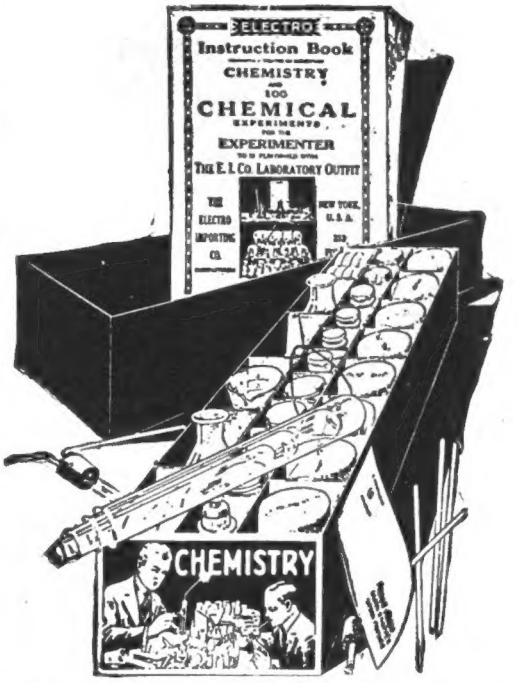

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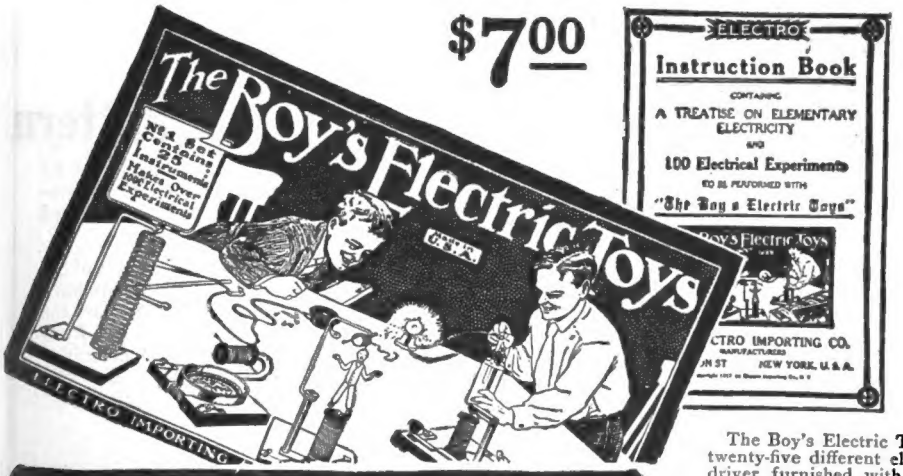

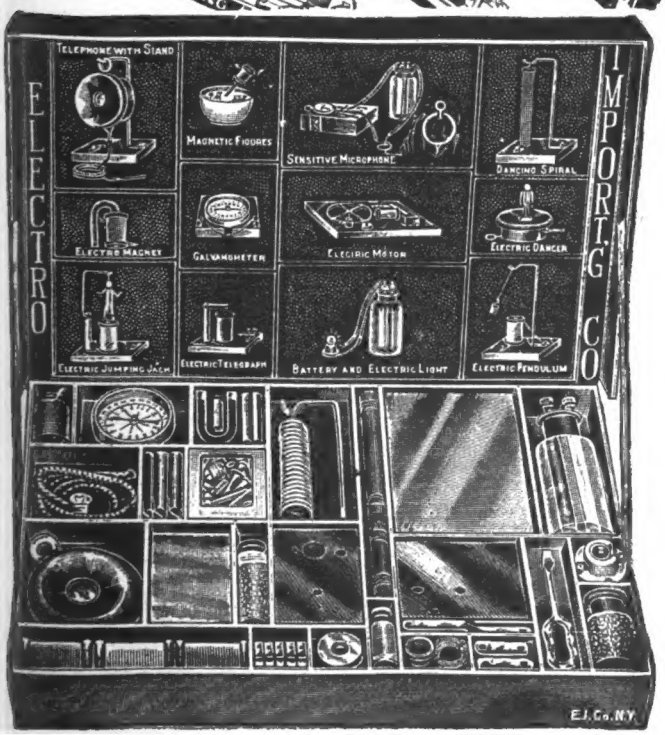

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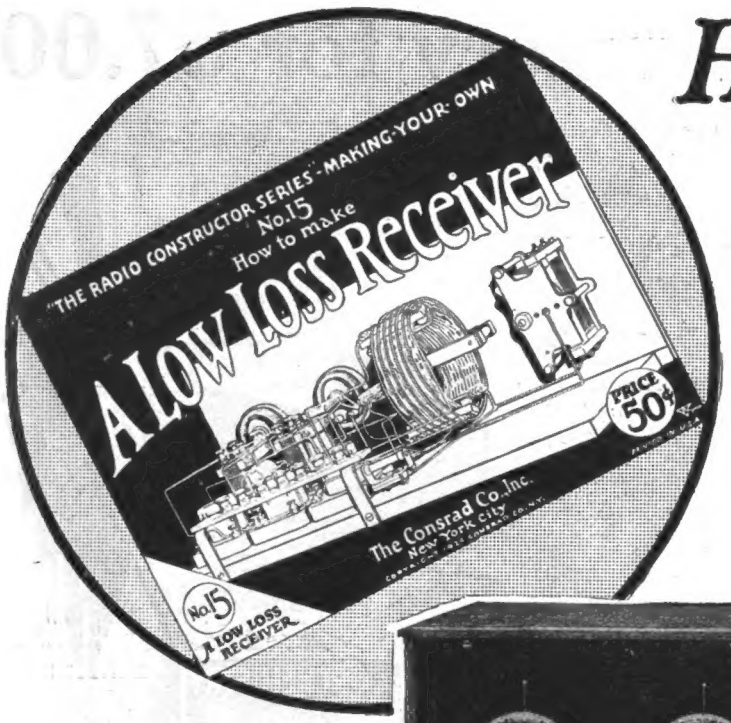

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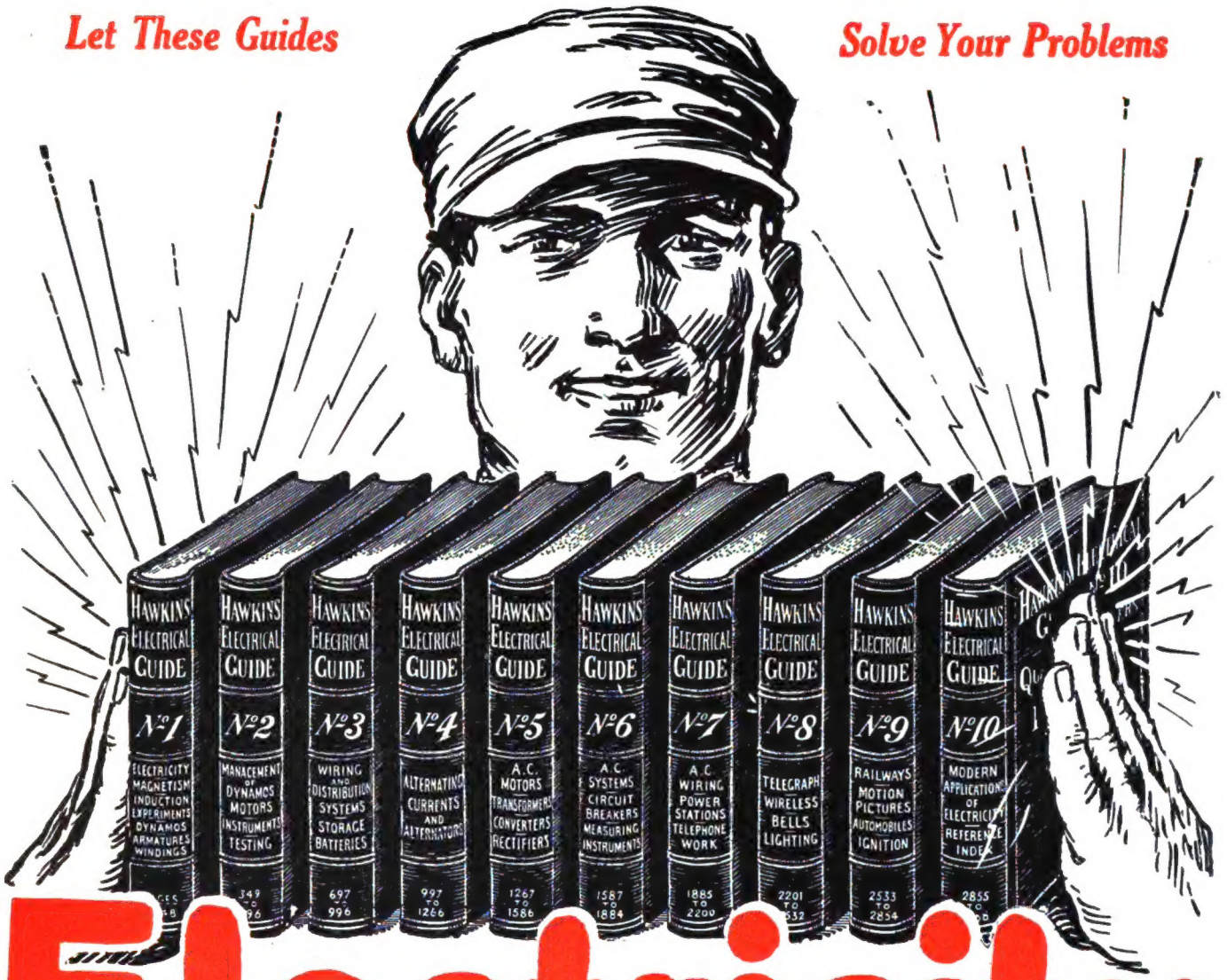

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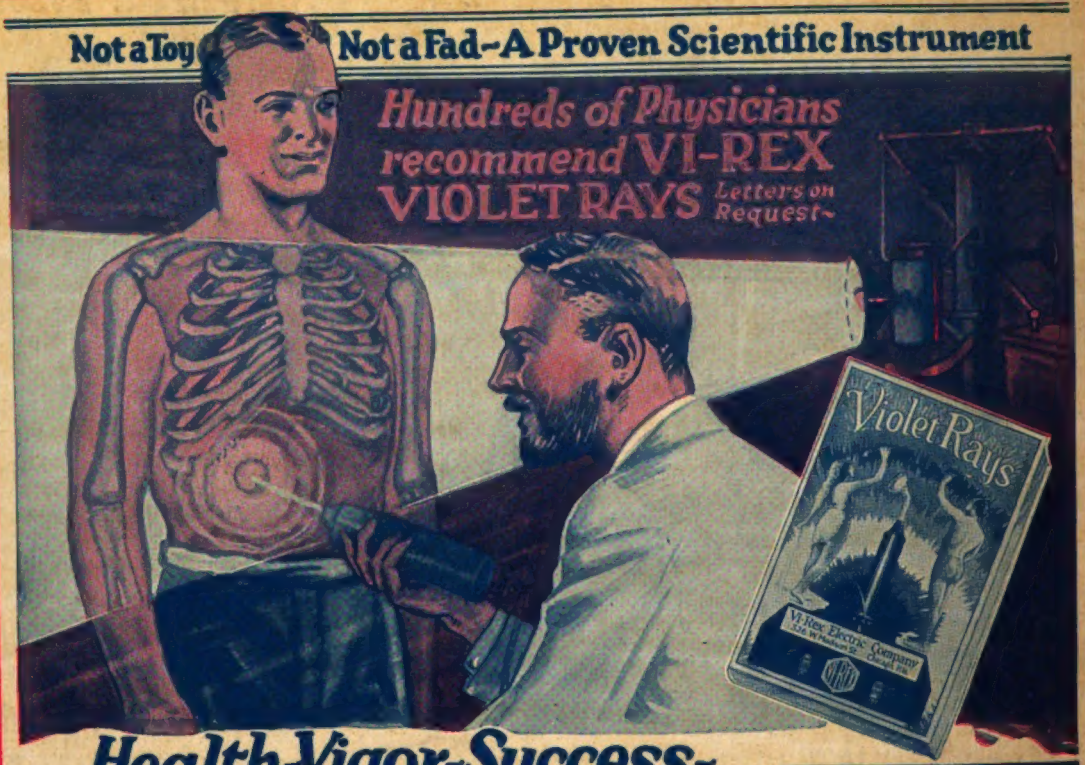

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